

JVC Service Manual

COLOUR VIDEO CAMERA

MODEL GX-33E

CAMERA ADAPTER

MODEL GA-23E

VICTOR COMPANY OF JAPAN, LIMITED.

No. 8153

JVC Service Manual



MODEL GX-33E

VICTOR COMPANY OF JAPAN, LIMITED

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SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual describes the principles and adjustments of electrical operation of the GX-33E colour video cameras. Service procedures given herein cover only field maintenance services. Adjustments which require high-level instrument, jigs and techniques are excluded, since they should be performed at a JVC Regional Center for factory service.

Due to design modifications, the servicing procedures and data given in this manual are subject to possible change without prior notice.

1.2 FEATURES

- Weighing in at only 1.4 kg with handgrip, the handgrip, the handy GX-33E presents an 8-mm-like "camera feel", yet its picture quality is excellent enough to deliver well-defined beautiful colour pictures.
- When used in combination with a portable video cassette recorder, the GX-33E can be driven by the recorder's built-in battery pack; so on-the-spot out-of-doors recordings can be performed with ease.
- The built-in single-lens reflex viewfinder permits real-image focusing and zooming.
- The automatic iris control mechanism saves you inconvenience in setting the aperture according to the lighting condition; manual override is also possible.
- The colour compensator switch helps adjust the colour balance accurately in a single operation.
- A sensitivity select switch is provided to facilitate recordings under low lighting conditions (as low as 100 lux).
- A lock mechanism for the recording switch offers a running-lock mode in which recording continues even when you release your finger from the switch, and a safety-lock mode which prevents this recording switch from being accidentally engaged during transportation.
- The handgrip is detachable to facilitate flexible applications.
- A high-sensitivity microphone is built-in to pick up sound simultaneously with pictures.
- A low power consumption of 7.5 watts has been achieved through a design with emphasis on economy.

1.3 PRECAUTIONS

- Do not aim the camera lens directly at extremely bright objects such as the sun or other strong light sources. Do not keep the lens directed at bright lights for long periods. These incorrect usages could burn the vidicon target. When the camera is not in use, be sure to cap the lens.
- Do not allow inflammables, water or metallic objects to enter the camera, as this will cause damage or malfunctioning.
- Do not subject the camera to high temperatures for long periods of time. Subjecting it to direct sunlight or placing it near heater may cause its cabinet to become deformed or the semiconductors and mechanical parts to malfunction.
- Do not disassemble any part of the unit, as electric shocks could result.
- Be careful not to subject the camera to excessive vibrations or shocks.
- Avoid using the camera near radio or TV transmitting antennas or motors and magnets which produce strong magnetic fields, as these could cause distorted pictures.

If the camera is left unused for a long period of time, the vidicon tube deteriorates. Be sure to operate the camera with the power on for 1 – 2 hours at least once every 6 months.

WARNING:

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

This video camera should be used with 12 V DC only.

CAUTION:

To prevent electric shocks and fire hazards, do NOT use any other power source.

1.4 CONTROLS AND CONNECTORS

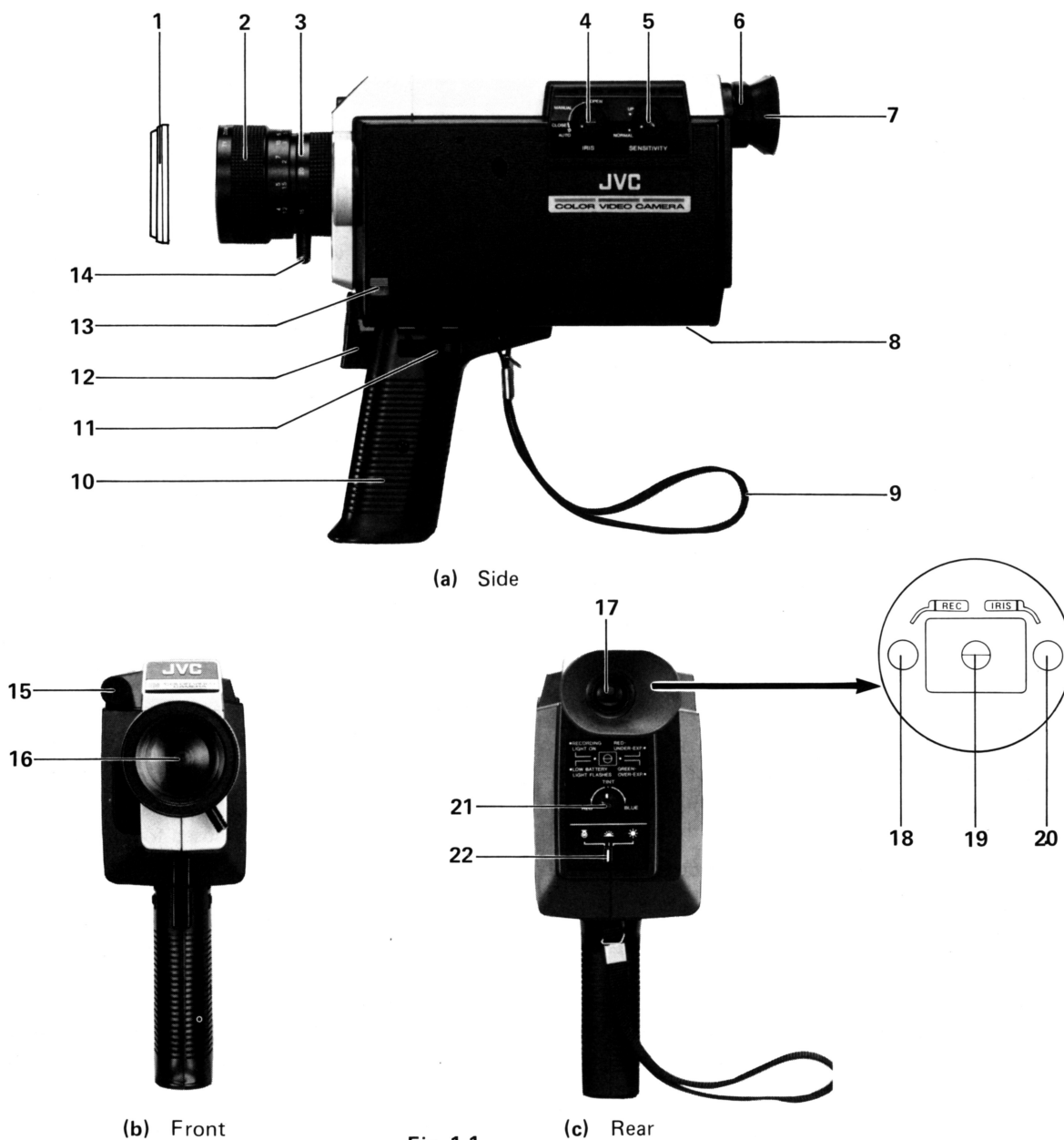


Fig. 1-1

1. **Lens cap**
2. **Focus ring**
Rotate to focus the lens.
3. **Zoom ring**
Rotate by the zoom lever to zoom from telephoto to wide-angle or vice versa.
4. **AUTO/MANUAL IRIS control knob**
Set it to the AUTO position for normal shooting. Turn in the MANUAL range to adjust the iris manually.
5. **SENSITIVITY select switch**
Normally leave it in the NORMAL position. Set it to the UP position when sufficient illumination is not available.
6. **Diopter control ring**
Turn it to suit the lens to your eyesight, see page .
7. **Eye cup**
8. **Camera cable connector**
Connect the camera cable (provided) for the connection of a video recorder or a camera adapter.
9. **Wrist strap**
10. **Handgrip**
11. **Handgrip retaining screw**

12. Recording switches

Two switches, one on the camera body and one on the handgrip, are interlinked for joint operation when the handgrip is attached. Press to start the tape and release for stopping the tape. See the next page for more information.

13. Lock lever

To lock or unlock the recording switch. For more details, see the next page.

14. Zoom lever

15. Built-in condenser microphone

High-sensitivity, omni-directional microphone. During outdoor shooting, attach the provided wind screen.

16. Zoom lens

f/1.9, 3X zoom lens ($f = 15 - 45$ mm)

17. TTL (through-the lens) optical viewfinder.

18. Recording indicator/Battery warning lamp

Lights red during recording and flickers red when the power of the battery pack (built into the portable recorder) becomes insufficient during recording.

19. Split-image range finder

For focusing, turn the focus ring until the images in the upper and lower half circles coincide with each other. For more details, see page. 1-8.

20. IRIS indicator lamp

Lights red for under-exposure and lights green for over-exposure. No light means that you are shooting with correct exposure.

21. TINT control

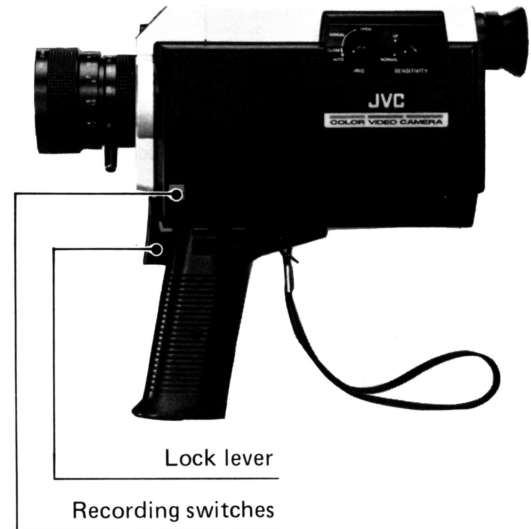
Use to adjust tint. Turning clockwise increases bluish tint; counterclockwise increase reddish.

22. Colour compensator switch

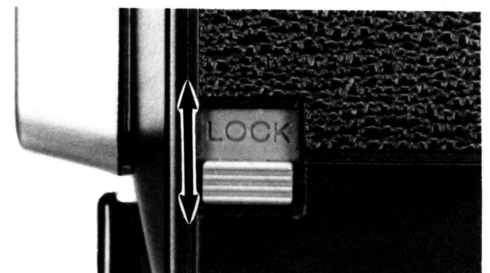
Adjusts colour according to the lighting conditions. For more details, see page 1-9.

*** Some notes on the recording switches and their lock lever**

When the handgrip is attached, press recording switch ②. When the camera is mounted on a tripod with the handgrip removed, press recording switch ①.



(a)



(b)

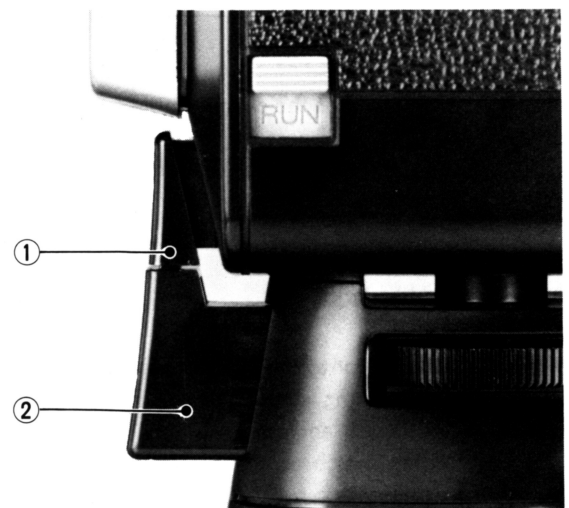


Fig. 1-2

	Starting the tape	Stopping the tape ^a
Normal shooting	(1) Set the lock lever to the RUN position. (2) Press the recording switch.	● Release your finger from the recording switch.
Running lock	(1) Set the lock lever to RUN. (2) Press the recording switch. (3) While holding the recording switch pressed, set the lever to LOCK. The recording switch will be locked in for continuous recording.	● Set the lock lever to RUN. The recording switch will pop up and recording will stop. ● If you press the recording switch in this state, recording will start once again.
Safety lock	Set the lock lever to LOCK when the recording switch is in its "out" position. The recording switch will be locked in this state and cannot be engaged. Employ this facility when you are carrying the camera to prevent the recording switch from accidentally being engaged during transportation.	

1.5 PREPARATIONS

Connecting the camera cable

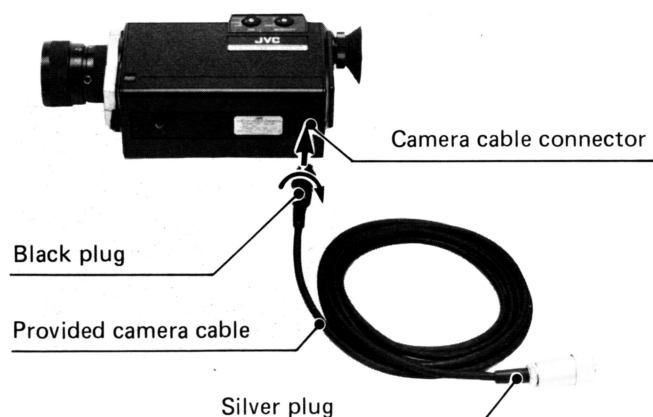


Fig. 1-3

Insert the black plug of the camera cable (provided) into the camera cable connector on the bottom of the camera body and tighten the retaining ring securely in direction of the arrow.

Attaching the handgrip

Affix the handgrip onto the bottom of the camera while inserting the retaining screw and the stopper into the corresponding holes and aligning the protruding part of the recording switch on the handgrip into the recess of the recording switch on the camera body. Then turn the knurled ring of the retaining screw in the direction of the arrow to secure the handgrip to the camera firmly.

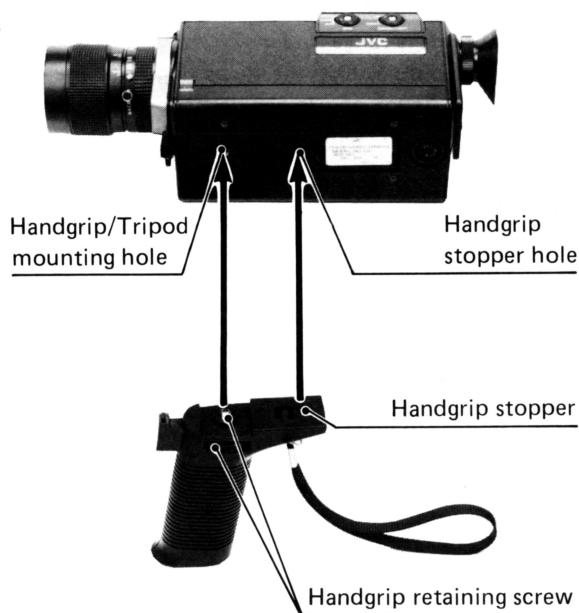


Fig. 1-4

Attaching the wind screen and the lens cap

Fit the wind screen (provided) onto the camera microphone. Turning the wind screen will facilitate fitting.

Employ the wind screen (provided) onto the camera outdoors. Rustling noise due to wind will be reduced in recordings.

- Connect the lens cap hook to the wrist strap ring.

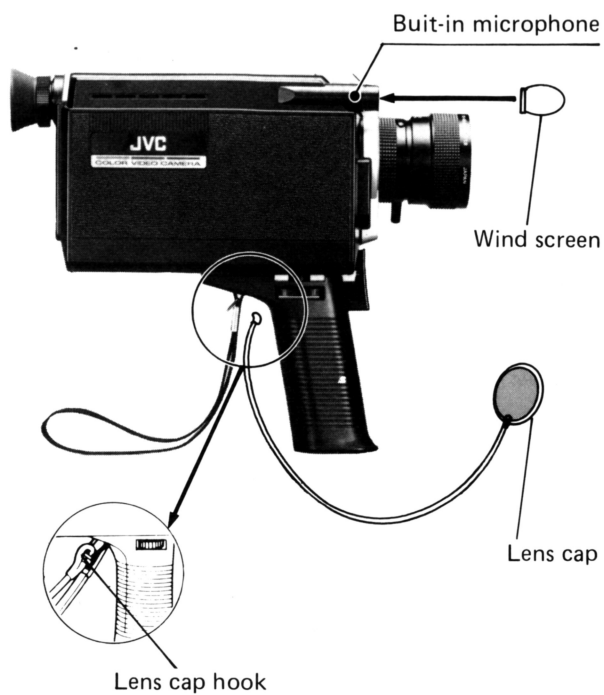


Fig. 1-5

Mounting onto a tripod



Fig. 1-6

Mount the camera on the trippod and tighten the lock screw provided on the tripod.

1.6 CONNECTIONS

Connecting to a JVC portable video cassette recorder



Fig. 1-7

1. Set the lock lever on camera to the LOCK position to prevent the recording switch from becoming engaged.
- Operate the lock lever with the recording switch in its "out" position.

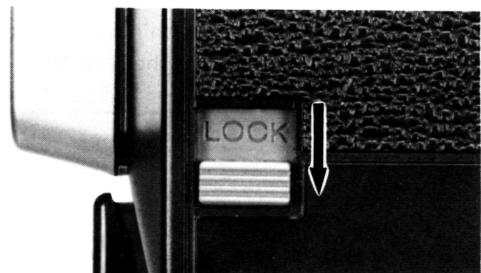


Fig. 1-8

2. Insert the black plug of the camera cable (provided) into the camera cable connector on the retaining ring firmly by turning in the direction of the arrow.



Fig. 1-9

3. Insert the silver plug of the camera cable into the camera connector on the portable recorder and tighten the retaining ring firmly by turning in the direction of the arrow.

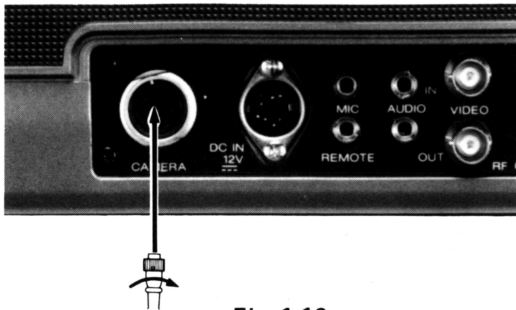


Fig. 1-10

Caution:

Other brands of recorders may not be electronically compatible, even though the same type of connector is used

3. Connect the AUDIO OUT terminal of the adapter to the audio input terminal of the recorder.
4. Connect the REMOTE connector of the adapter to the REMOTE PAUSE connector of the recorder using the remote control cable supplied with the adapter.

Note:

With video recorders which are not equipped with a remote pause control terminal the camera's recording switch does not function. Be sure to operate the recorder for starting and stopping the tape transport.

Connecting to a JVC stationary video cassette recorder

If you use this camera in combination with a video recorder other than the JVC portable video cassette recorder, an additional camera adapter is needed.

1. Connect the camera cable to the camera connector (CAMERA) of the adapter.
2. Connect the VIDEO OUT terminal of the adapter to the video input terminal of the recorder.

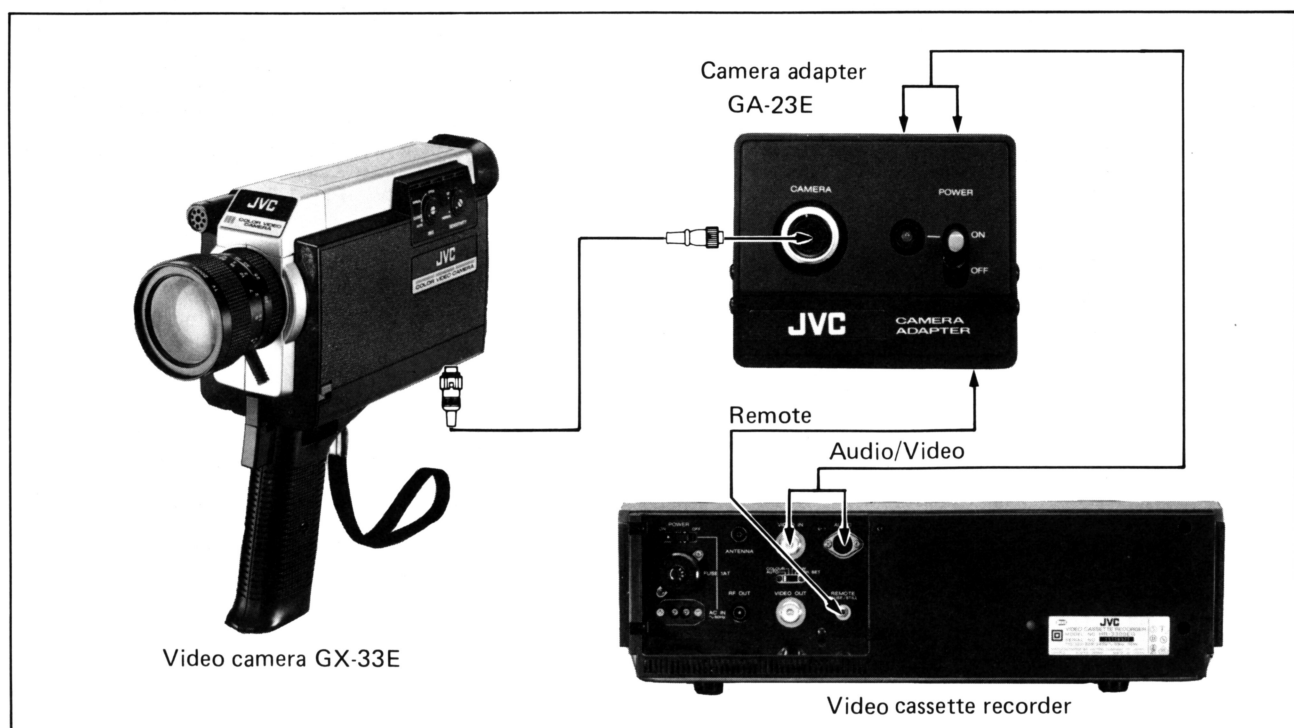


Fig. 1-11

1.7 RECORDING OPERATION

1. Set the lock lever to the LOCK position.
 - Operate the lock lever with the recording switch in its "out" position. If the recording switch has been engaged and locked, first set the lock lever to the RUN position to release the recording switch and then set the lock lever to the LOCK position.



Fig. 1-12

2. Set the IRIS knob to the AUTO position.
 - For manual control, see page 1-9.



Fig. 1-13

3. Depress the REC and PLAY keys of the recorder simultaneously. Now, the Record standby mode is obtained.

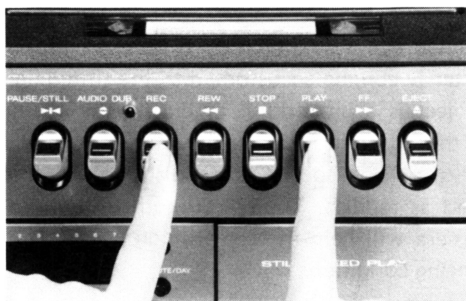


Fig. 1-14

4. Set the lock lever to the RUN position and, after confirming the focus and composition, press the recording switch. Recording will start and the recording indicator (left lamp in the viewfinder) will light.

If you wish to continue recording in this state, shift the lock lever from RUN to LOCK while holding the recording switch pressed.



Fig. 1-15

5. Release the recording switch to stop recording.
 - If the Standby mode continues for more than 5 minutes, release the Standby mode by setting the recorder in the Stop mode.

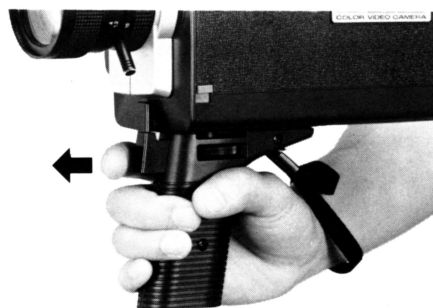
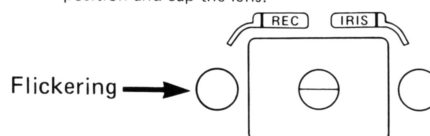


Fig. 1-16

When using recorders other than the JVC portable recorders, refer to the relevant instruction booklet for recording procedure.

CAUTION

- Do not continue the Standby mode for more than 5 minutes. Release the Standby mode by depressing the recorder's STOP key.
- If the recording indicator begins to flicker it means that the battery power is not sufficient. In such a case, stop recording and replace or recharge the battery pack in the recorder.
- If you continue to shoot with the battery warning lamp flickering, recordings of normal pictures cannot be obtained. Also, once the battery pack is fully discharged, it is unable to be recharged. It is, therefore, recommended that the battery pack be replaced as soon as the battery warning lamp should start flickering.
- After shooting, set the lock lever to the LOCK position and cap the lens.



1.8 FOCUSING

Dipter Control

Before you use this camera or when the camera operator is changed, diopter control is required to adjust the lens to suit the operator's eyesight, OTHERWISE SHARPLY INFOCUSED PICTURES MAY NOT BE OBTAINED.

1. Turn the zoom ring fully toward wide-angle (15 mm).
2. Set the focus ring to infinity (∞).
3. Aim at a subject that's more than 20 m from the camera so that its vertical outline appears in the split-image range finder.
4. Turn the diopter control ring until the images in the upper and lower half circles are aligned with each other.

Note:

If the available subject is not more than 20 m away due to the shooting location, adjust the focus ring to 3 m and select a suitable subject that's 3 m away from the camera.

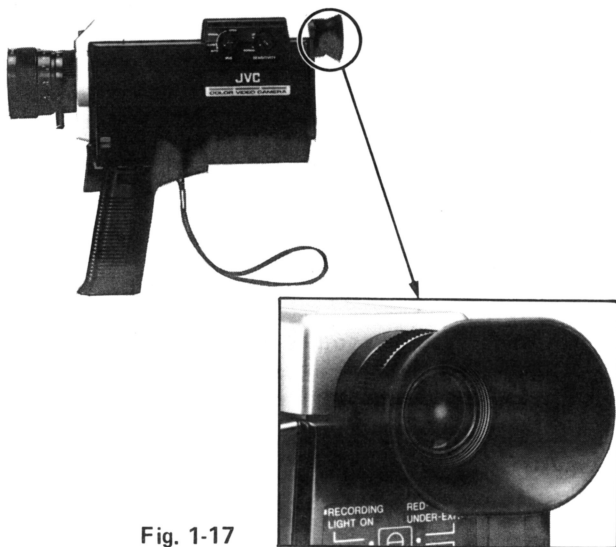
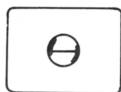
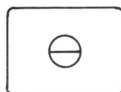


Fig. 1-17

Easy way of diopter control



Before
adjustment



After
adjustment

- Turn the diopter control ring until the circle in the viewfinder presents a clear thin line.
- Pointing the lens at the open sky or a plain wall will facilitate this adjustment.
- There is no need to adjust the focus and zoom rings.

Focusing

1. Turn the zoom ring to zoom in on a subject (maximum telephoto).
2. Position the subject so that its vertical outline comes into the split-image range finder and turn the focus ring until the images in the upper and lower half circles are aligned with each other referring to the vertical line.

Note:

Be sure to focus the lens in the maximum telephoto position, otherwise sharply-focused images cannot be obtained when the subject is zoomed up during recording.

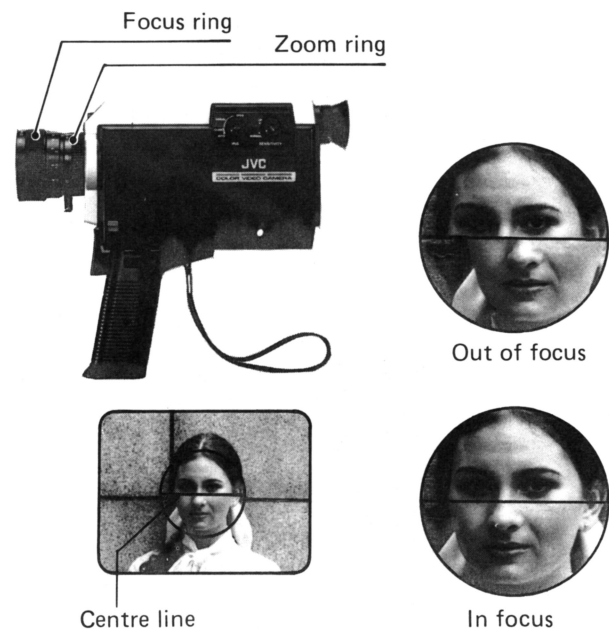


Fig. 1-18

1.9 COLOUR COMPENSATION

The human eye is adaptable to different lighting, therefore after becoming accustomed to the tinted lighting, if the subject is a bit reddish or bluish, the eye does not detect the difference. But cameras are not so adaptable, and if the light source is reddish, white things are recorded as reddish. The colour compensator switch of the camera will help the camera compensate for different lighting conditions.

TINT control

The TINT control makes a more delicate colour adjustment possible. Turning the TINT control clockwise increases the bluish tint while turning it counter-clockwise increases reddish tint. This adjustment should be made while viewing the picture on a connected monitor. If a monitor is not available, leave the TINT

control at its center click-stop position. This control functions for all three settings ( Indoor,  Moring/Evening,  Outdoor) of the colour compensator switch.



Fig. 1-19

1.10 IRIS CONTROL

Automatic iris control

This camera is provided with an automatic iris control mechanism which adjusts the lens aperture according to the amount of entering light. In most situations, the automatic iris control mode (with the IRIS knob set to AUTO) produces satisfactory results.

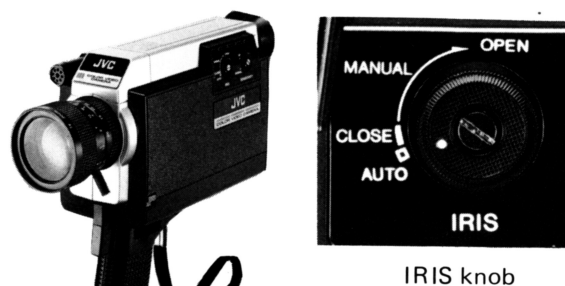


Fig. 1-20

Switch position	Lighting	Description
  	Outdoors in the daytime.	Set the switch to the outdoor position regardless of the weather when you shoot in the daytime outdoors. However, in smoggy urban or industrial areas or in the afternoon in winter, the picture becomes reddish. In such cases, set the switch to the morning/evening position. On the other hand, under a cloudy sky, in the rain or in the shade, the picture becomes bluish. In such cases, fit a colour conversion filter (available on the market) onto the front of the lens.
  	Outdoors in the morning or evening, or under fluorescent lighting.	The picture becomes reddish under fluorescent lighting or in the morning or evening. To compensate for this, set the switch to the morning/evening position. If you wish to emphasize the red or the morning light or evening glow, leave the switch set at the outdoor position.
  	Halogen lamp or tungsten lamp.	This indoor setting will provide satisfactory results with most halogen and tungsten lighting.

- Align the white index mark on the knob to the AUTO position.

Notes:

- The IRIS indicator lamp in the viewfinder may flash from time to time even in the automatic iris control mode. This is not due to any defect of the unit.
- If the IRIS indicator lamp remains lit red, the amount of light is insufficient. Apply additional illumination.

Manual iris control

- Turn the IRIS knob in the MANUAL range so that the IRIS indicator lamp in the viewfinder extinguishes.



Fig. 1-21

Note:

If you switch the iris control mode from AUTO to MANUAL, during recording, the picture becomes dark because the lens aperture is first closed and then widened as the IRIS knob is turned toward the OPEN direction. Therefore, first stop recording and then switch the iris control mode.

1.11 MAKING GOOD COLOUR PRODUCTIONS

SENSITIVITY select switch

Sensitivity select switch

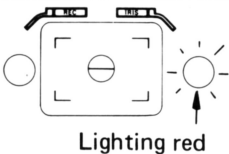
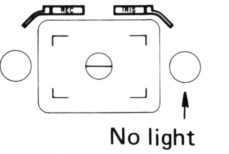
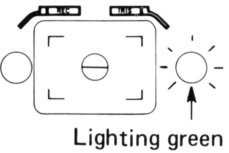


Fig. 1-22

This switch is provided to enable shooting under low-lighting conditions by raising the camera's sensitivity. When the IRIS indicator lamp continues lighting red in the AUTO mode or when it fails to extinguish in the MANUAL mode when the IRIS knob is fully turned toward OPEN, set this switch to the UP position. For situations other than those mentioned above, be sure to set the SENSITIVITY select switch to the NORMAL position.

Neutral density (ND) filter

When shooting in fine weather, especially in snow-covered mountains or by sea shores, the amount of entering light is likely to become excessive. In such cases, even though the AUTO mode provides correct exposure, the resulting pictures will lack depth. To reduce the amount of entering light and obtain beautiful images, be sure to use an ND filter (ND-8, 55 mm dia, available at camera shops).

	IRIS indicator lamp	Recorded picture	Adjustment	Remarks
Under-exposure	 Lighting red		Turn the IRIS knob toward OPEN until the lamp extinguishes.	If the lamp fails to extinguish even when the knob is fully turned toward OPEN, set the SENSITIVITY switch to the UP position. If this still fails to serve the purpose, additional illumination is required.
Optimum exposure	 No light		Shoot always after confirming that the IRIS indicator lamp is not lit.	The SENSITIVITY select switch should be at NORMAL except in this case. See section 1.11.
Over-exposure	 Lighting green		Turn the IRIS knob toward CLOSE until the lamp extinguishes.	If the lamp fails to extinguish even when the knob is fully turned toward CLOSE, the amount of light is excessive. Use a neutral density (ND) filter. See section 1.11.



ND filter (N)-8, 55 mm dia.)

Fig. 1-23

Subject illumination

Only when the lighting on the subject is optimal, may the best colour pictures be obtained.

Illuminance

- The GX-33E is designed to provide the best pictures under the conditions of a 700 lux illuminance.
- Although the reference illuminance is 700 lux, lighting of 100 lux can be utilized with good results if the SENSITIVITY switch is set to "UP". Less than 100 lux will provide under-exposed dark pictures. It is recommended for good colour pictures that you shoot under lighting of more than 700 lux.

Lighting equipment

Points to be remembered

- A key point for obtaining good colour pictures is to uniformly illuminate the scene to be shot. Try to apply light not only to the subject but also its surroundings. Exercise care to avoid too dark or too bright background.
- Reflections of light from a window glass or mirror will degrade pictures. If there is a reflecting object, move it away from the subject or shift the lighting position or the camera angle.
- Secure the lighting equipment if possible. A hand-held lighting device is likely to move and cause the shadow of the subject to move. This will result in pictures which appear unstable.
- If natural light is mixed with artificial light, which is likely to happen next to windows, correct colours of the subject cannot be reproduced. It is recommended in such cases that curtains in the room be closed to shut out light from outside.

1.12 SPECIFICATIONS

Colour system	: Single-carrier frequency multiplex system
Pickup tube	: Single-tube, 17 mm (2/3") electrostatic focus, electromagnetic deflection vidicon tube
Scanning system	: 625 lines, 2:1 interlaced PAL-type output
Lens	: f/1.9, 3X zoom lens (f = 15 – 45 mm) Auto-iris control, filter diameter: 55 mm
Viewfinder	: Through-the-lens optical viewfinder, Split-image focusing with diopter adjustment
Colour compensation	: Indoor/Morning & Evening/Outdoor switchable with manual adjustment
Video output	: 1 Vp-p, 75 ohms
Microphone	: Built-in electret condenser microphone, omni-directional –64 dB/1 k-ohm
Audio output	: –20 dB, low impedance
Horizontal resolution	: 250 lines
Video S/N ratio	: 45 dB (Rohde & Schwarz noise meter)
Minimum practical illumination	: 100 lux (Sensitivity switch at "UP")
Automatic light compensation	: 100 – 100 000 lux
Operating temperature	: 0°C – 40°C
Power consumption	: 12 V DC, 7.5 watts
Dimensions	: 77(W) x 120(H) x 269(D) mm (without handgrip) 77(W) x 225(H) x 269(D) mm (with handgrip) (3-1/16" x 9" x 10.5/8")
Weight	: 1.4 kg (with zoom lens and handgrip)
Accessories provided	: Camera cable Wind screen for microphone

Design and specifications subject to change without notice.

E. & O. E.

SECTION 2 TECHNICAL DESCRIPTION

INTRODUCTION

The GX-33E/66E is a single tube type color video camera based on the frequency-separation system. Distinguishing features of this camera include use of a cross stripe filter and a single-lens reflex type optical viewfinder design. A simplified block diagram of the optical and electronic systems is shown in Fig. 2-1.

2-1 OPTICAL SYSTEM

Incident light from the camera subject passes through the zoom lens and is focused on the photosensitive layer (target) of the vidicon tube. As can be noted from Fig. 2-1, the following elements are inserted between the zoom lens and the vidicon target.

1) Half mirror

This element reflects 25% of the incident light for use by the optical viewfinder, while the remaining light passes through.

2) Iris

An automatic iris is included which compensates for variations in scene illumination so that a fixed volume of light becomes applied to the vidicon.

3) Master lens

Optically compensates for the additional elements between the zoom lens and vidicon target.

4) Crystal filter

This is an optical filter for reducing cross color. Cross color is a phenomenon whereby an image containing a finely striped pattern (such as a performer wearing a striped costume) generates artificial colors due to moire effects with respect to the camera optics and electronics.

5) Infrared filter

This filter absorbs energy in the infrared region in order to avoid color error and adverse effects on the vidicon.

A single-lens reflex type of viewfinder is employed. The portion of the incident light reflected by the half mirror goes through a relay lens to a reflecting mirror to become focused on the viewfinder.

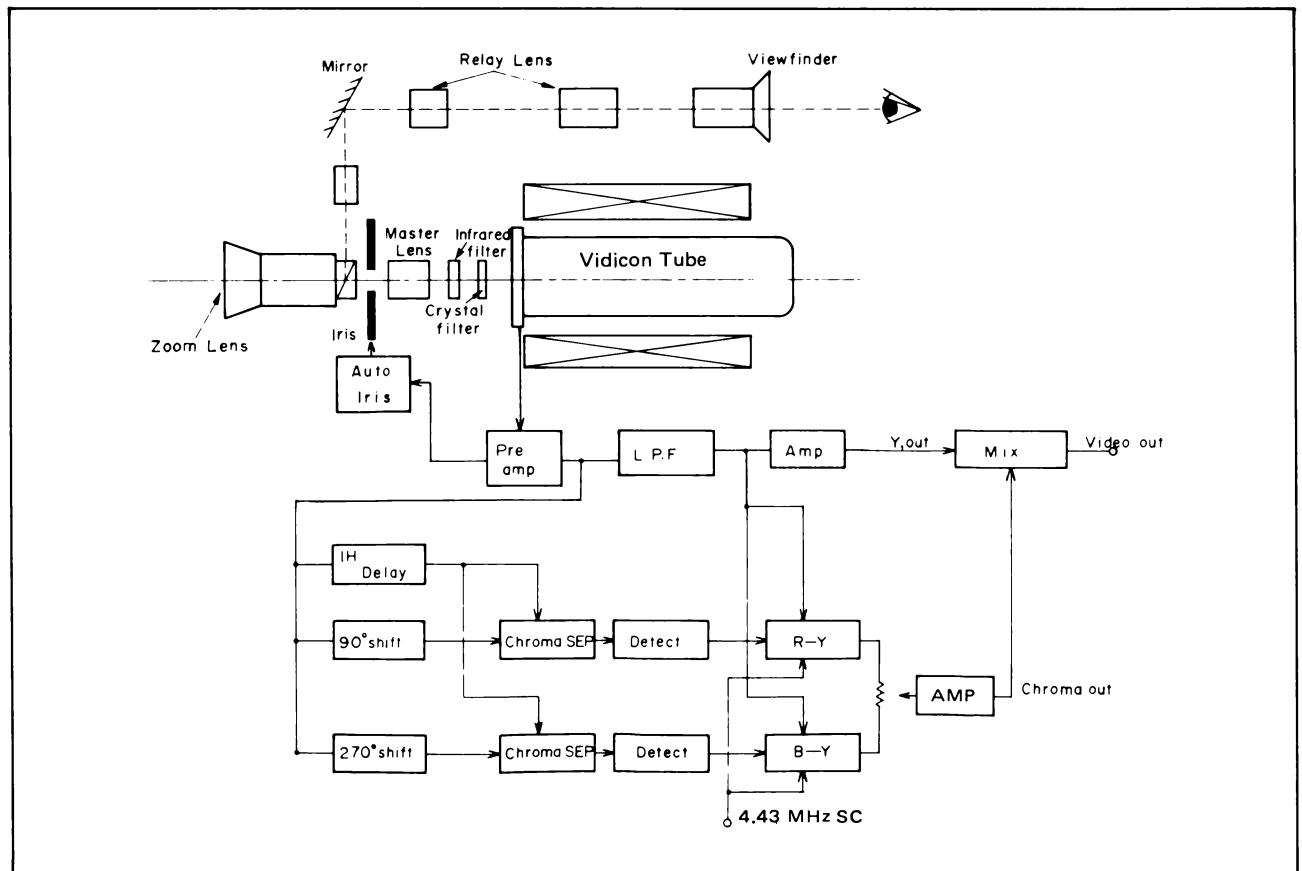


Fig. 2-1

2-2 ELECTRICAL SYSTEM

The electrical system functions to convert the signal from the vidicon into an NTSC type color television signal. In order to obtain satisfactory color reproduction utilizing a 2/3" vidicon, a newly developed single sub-carrier frequency separation system is employed. The principle of this system is outlined in the following paragraphs.

A) Stripe filter

Although there are various methods of obtaining color from a single pickup tube, this camera uses a stripe filter such as shown in Fig. 2-2. The filter is composed of alternating yellow and cyan stripes arranged at a 27.26° angle from the vertical. As the filter is scanned horizontally from left to right, the first line (n) produces a repeating white – green – white – green . . . output, while the next line (n + 1) yields a cyan – yellow – cyan – yellow . . . output.

Note, however, that in addition to the different color sequence, the phase between lines (n) and (n + 1) advances by an angle equal to the stripe filter inclination angle. This phase difference is employed for color signal separation.

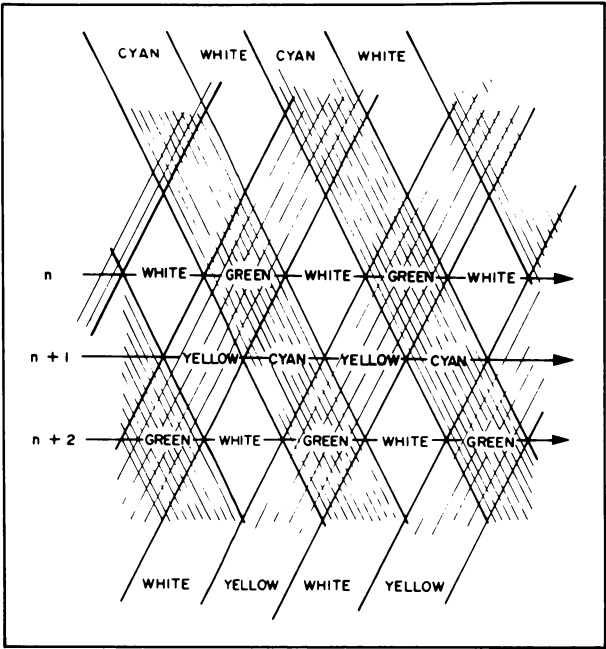


Fig. 2-2

B) Color demodulation

For the sake of consistency, n – 1 is used in place of n + 1 in the following description. Note that n – 1 and

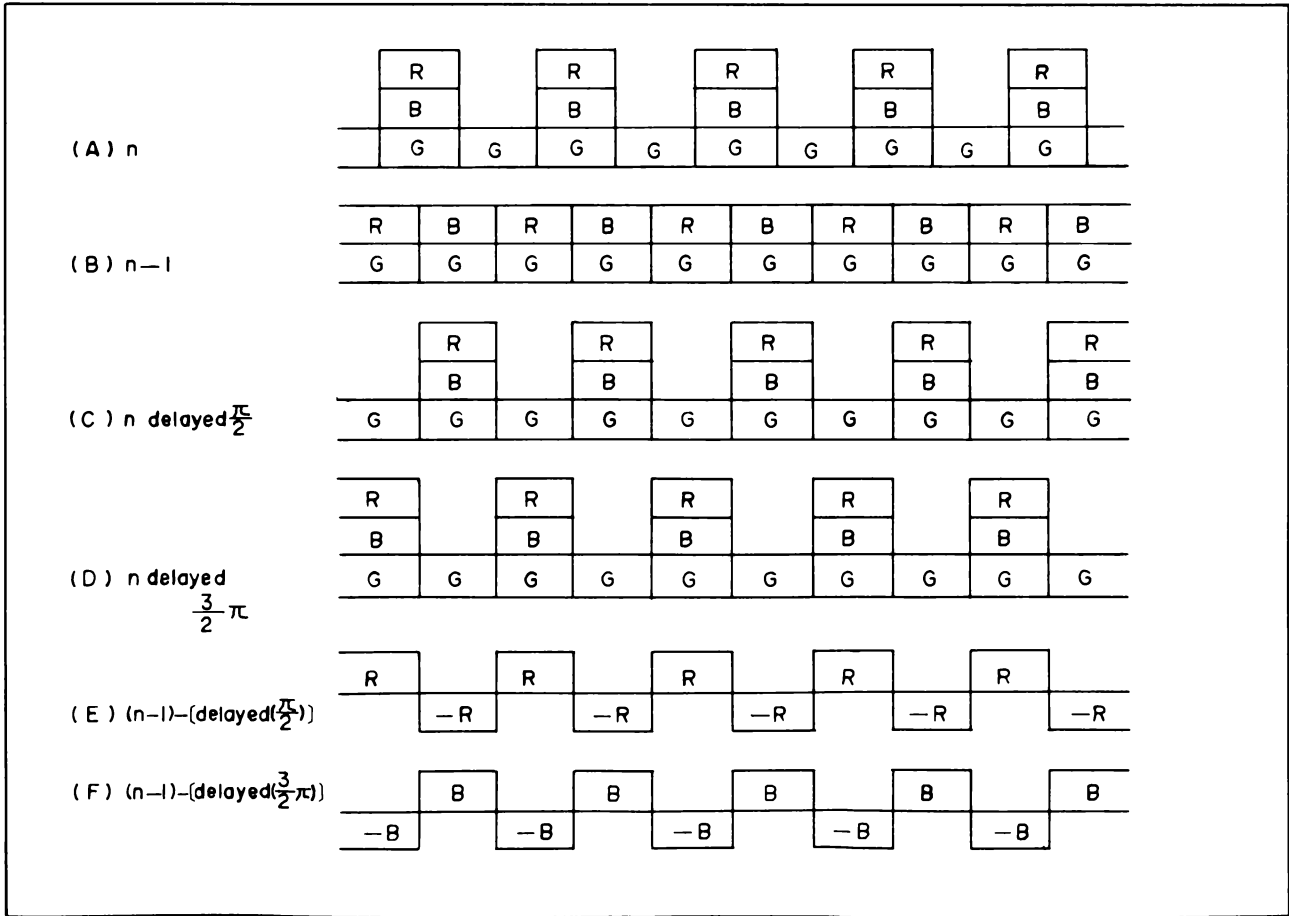


Fig. 2-3

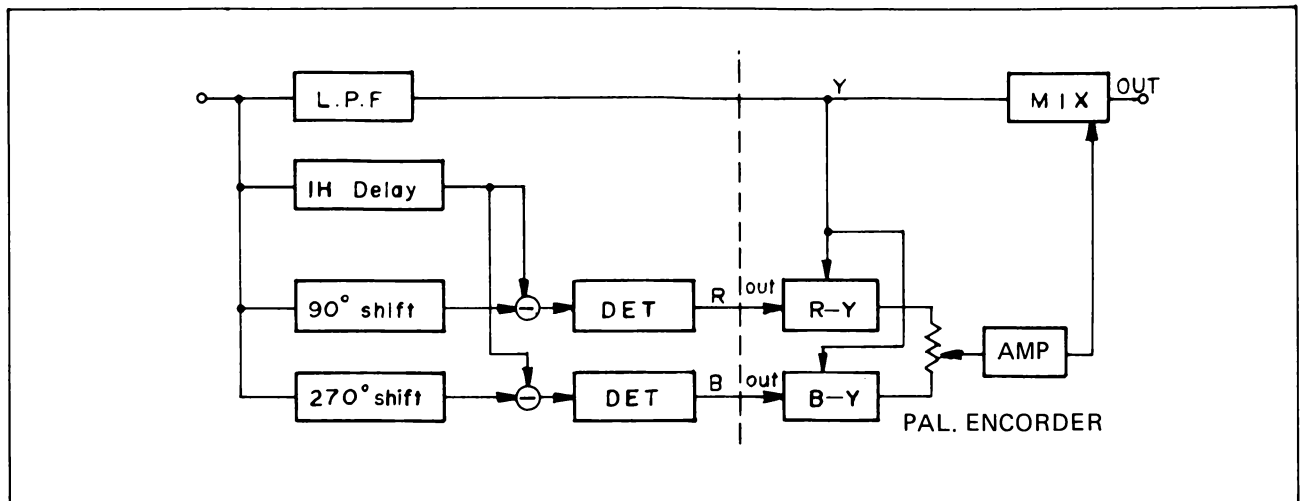


Fig. 2-4

$n + 1$ are equal, since they are the lines before and after n respectively.

An example is shown in Fig. 2-3 of a voltage waveform output (idealized) when a white colored subject is picked up by the vidicon through the stripe filter. As the vidicon tube electron beam scans the white – green – white . . . portion of the stripe filter, the output waveform (n) becomes as shown by A of Fig. 2-3.

At the next line, the cyan – yellow – cyan . . . pattern becomes traced, producing waveform B. Afterwards, horizontal scanning is performed in combinations of these two and the output goes to the preamplifier.

The preamp output consists of color (approx. 3.58 MHz) and luminance components. The luminance signal becomes separated by passing the preamp output through a lowpass filter (LPF).

Red and blue components are obtained through a circuit such as shown in Fig. 2-4 (also refer to Fig. 2-3). When line n is scanned, signal n (waveform A) goes through a 1H delay line to become $n - 1$ (waveform B). At the same time, signal n is also applied to a 90° shift circuit to become waveform C. Waveforms B and C are then subtracted to yield the R component.

Simultaneously, signal n is applied to a 270° shift circuit to yield waveform D. Waveforms C and D are then subtracted to produce the B component.

During the next line ($n - 1$ which is the same as $n + 1$), signal $n - 1$ (waveform B) is applied to the 1H delay line to become $n - 2$ (which is equal to n , since n and $n - 1$ alternate). At the same time, the $n - 1$ signal is shifted 90° . These are electrically subtracted to produce the R component.

Simultaneously, the $n - 1$ signal is applied to the 270° shifter, after which it is electrically subtracted from n ($n - 2$) to produce the B component.

Consequently, both R and B components are produced during each scanning line. Afterwards, they are modulated and mixed with luminance to become an NTSC type color signal.

2-3 MATHEMATICAL RELATIONSHIPS OF VIDICON OUTPUT SIGNALS

A) Output signal

When a white subject is focused on the vidicon through the stripe filter, the idealized output waveform (color multiplex signal) becomes as shown in Fig. 2-5. Cyan – clear – yellow – clear sections of the stripe filter are arranged at the same pitch in the horizontal scanning direction. At the same time, in the vertical scanning direction, the phase of each scanning line changes 90° . Energy of the electrical signal modulated by the stripe filter thus becomes substantially concentrated at $+1/4fH$ and $-1/4fH$ locations. The spectrum of each of these components deviates $1/2fH$, producing a mutually interleaved component, while the luminance signal becomes concentrated at fH .

The frequency multiplexed output signal from the vidicon tube at scanning line n is thus:

$$E(n) = E_Y + m (E_R \sin \omega t + E_B \sin \omega t)$$

At scanning line $n - 1$, this becomes:

$$E(n-1) = E_Y + m [E_R \sin (\omega t - \frac{\pi}{2}) + E_B \sin \omega t (\omega t + \frac{\pi}{2})]$$

In this ω = the red and blue modulated frequency

The frequency spectrum at this point is depicted in Fig. 2-6.

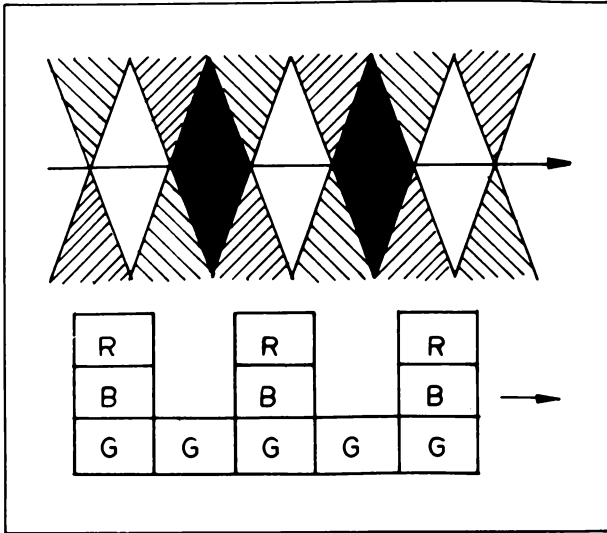


Fig. 2-5

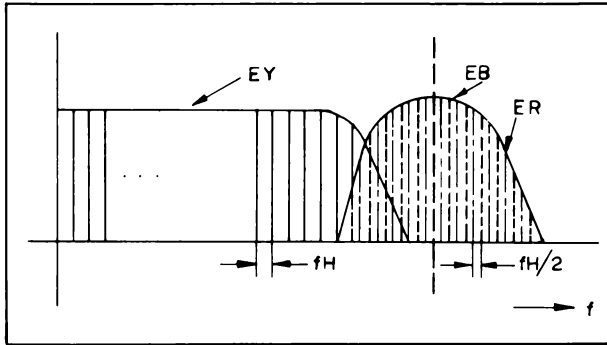


Fig. 2-6

B) Modulation subcarrier

As can be noted from the foregoing, the G component is continuous and not modulated, while the B and R components are modulated. When the image of a subject is modulated in this manner and scanned by the vidicon electron beam, the fundamental modulation subcarrier F becomes determined by the effective horizontal scanning width and effective horizontal scanning period of the vidicon.

$$F \text{ (MHz)} = \frac{W}{PT} \times 10^3$$

In this formula:

P = stripe filter pitch (μm)

T = vidicon effective H scanning period (μsec)

W = vidicon effective scanning width (mm)

For this model camera, these become:

$P = 40.5 \mu\text{m}$

$T = 51.75 \mu\text{sec}$

$W = 7.51 \text{ mm}$

$$F = \frac{7.51}{40.5 \times 51.75} \times 10^3 = 3.58 \text{ MHz}$$

C) Stripe filter inclination angle

The two principal factors of this color demodulation system are the determination of the reference frequency by the horizontal scanning direction and the inclination of the stripe filter in the vertical scanning direction. With the effective vertical scanning width taken as L , the effective vertical scanning time as T_V , and the vertical scanning rate as V_V , the following relationship is obtained:

$$V_V = L/T_V$$

Consequently, the scanning line spacing becomes:

$$L_V = V_V \times 64.0 \mu\text{sec}$$

With $L = 5.65 \text{ mm}$ and $T_V = 18.4 \text{ msec}$:

$$L_V = 0.307 \text{ mm/msec}$$

$$L_{VH} = L/T_V \times 64.0 \mu\text{sec} = 19.6 \mu\text{m}$$

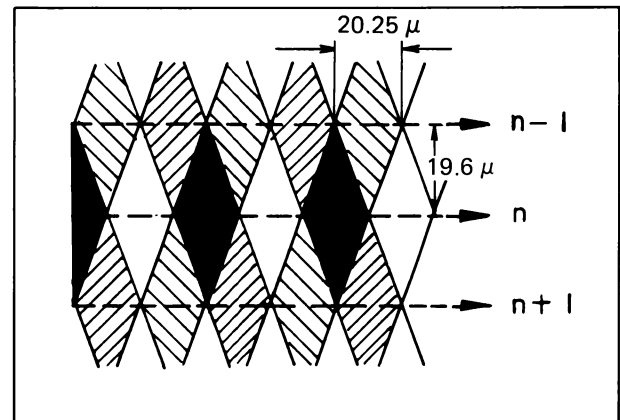


Fig. 2-7

2-4 SIGNAL PROCESS DESCRIPTION

2-4-1 Preamplifier

The vidicon itself contributes very little to the overall noise level of the camera. A more important element in determining the practical S/N is the first stage of the preamplifier.

Since the output impedance of the vidicon is very large, the high frequency component becomes attenuated by the vidicon output capacitance and the preamp input capacitance. In comparison to the low frequency (luminance) signal, the color signal modulated by the stripe filter tends to possess a poorer S/N. For this reason, a Percival circuit is incorporated in the preamp for improving the S/N of the color signal.

The first stage equivalent noise current density i_n^2 (A^2/Hz) becomes:

$$i_n^2 = 4KT \left[\frac{1}{R} (1 - \omega^2 LC_0)^2 + R_n \omega (C_0 + C_i) \cdot (1 - \omega^2 L \frac{C_i C_0}{C_i + C_0}) + r \omega^2 C_0 \right] A^2/Hz$$

$$R = \frac{R_1 R_2}{R_1 + R_2} \quad R_n = \text{FET equivalent noise resistance}$$

$$K_n = K \frac{0.65}{g_m} \quad K = \text{FET constant}$$

r = Percival coil equivalent noise resistance

$$r = KL(H) f(\text{MHz}) \quad K = \text{Core constant}$$

By selecting the JFET (junction type field effect transistor), noise becomes determined by the Percival coil impedance and core materials. The S/N of the color modulation frequency is improved by approximately 5 dB at $f_c = 3.58$ MHz.

2-4-2 Video Process

The video signal from the preamplifier goes to a video amplifier. Gain of this amplifier is selected by the sensitivity (SENS UP/NORMAL) switch. The amplified signal is applied to a clamp circuit, where it becomes clamped to the vertical sync component. The sync component thus becomes the initial reference level.

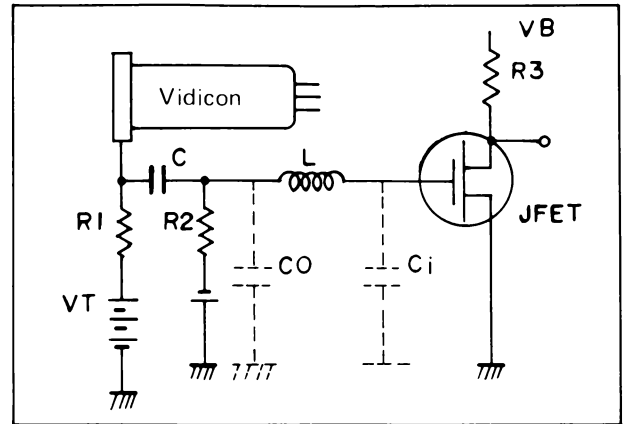


Fig. 2-8

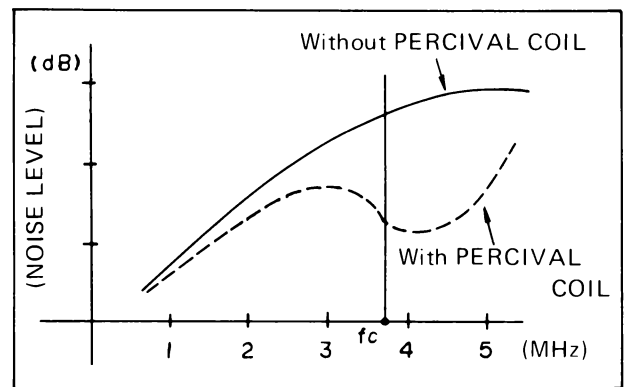


Fig. 2-9

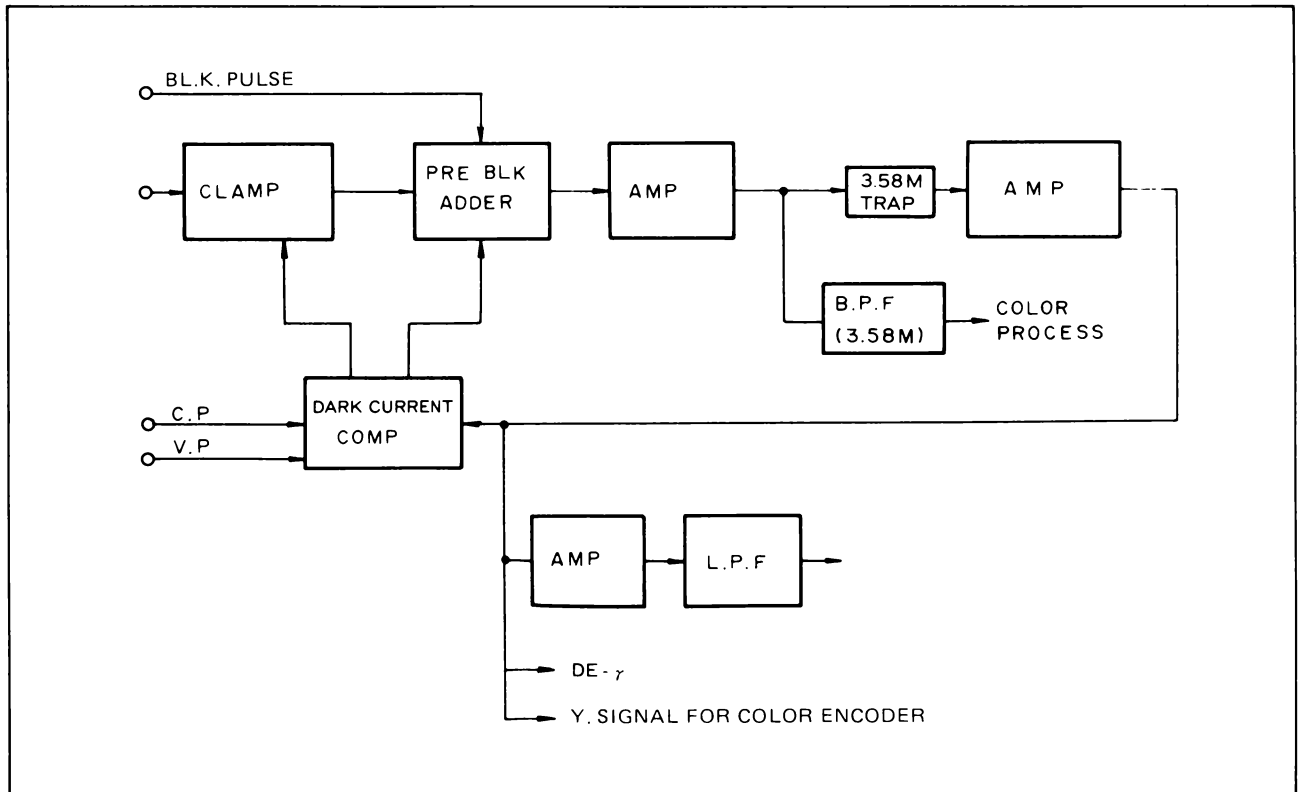


Fig. 2-10

During normal scene pickup, the vidicon dark current varies considerably according to the ambient temperature. A black mask is therefore provided for detecting the dark current and allowing compensation by IC5. The resulting video signal is distributed in three directions.

One of these is employed as luminance signal for the color encoder and another as degamma signal for the chroma separator circuit. The third line is used as the luminance component of the output signal and goes through a lowpass filter (LPF) for removing color components from the area of 3.58 MHz. The color component is sent to the color processing circuit, where red (R) and blue (B) components become separated.

A) Dark current compensator

Dark current of the vidicon varies according to both aging and ambient temperature. The size of the dark current limits the setting of the signal current. Consequently, one function of this clamp circuit is to perform DC restoration of the output signal.

Video signal (without color component) is applied to IC5 pin 20. The vertical sync component of this signal is switched by X1 and C1 charges. This charge voltage is compared with the preset voltage.

When the dark current increases due to ambient temperature rise, voltage of the vertical sync component also increases. This increased voltage is stored in C1 and a HIGH voltage becomes supplied to the minus terminal of IC1. At the same time, a fixed voltage derived from the power source is applied to the other input terminal of IC1. When the voltage at the minus terminal increases, IC1 output decreases. This output goes to amplifier IC2 pin 4 and the amplifier output decreases.

A black mask is contained at the lower portion of the vidicon faceplate (corresponding to the upper portion of the picture). The vidicon dark current is detected when this portion is scanned to produce the black scan signal and the circuit functions to equalize the clamp level with the dark current level.

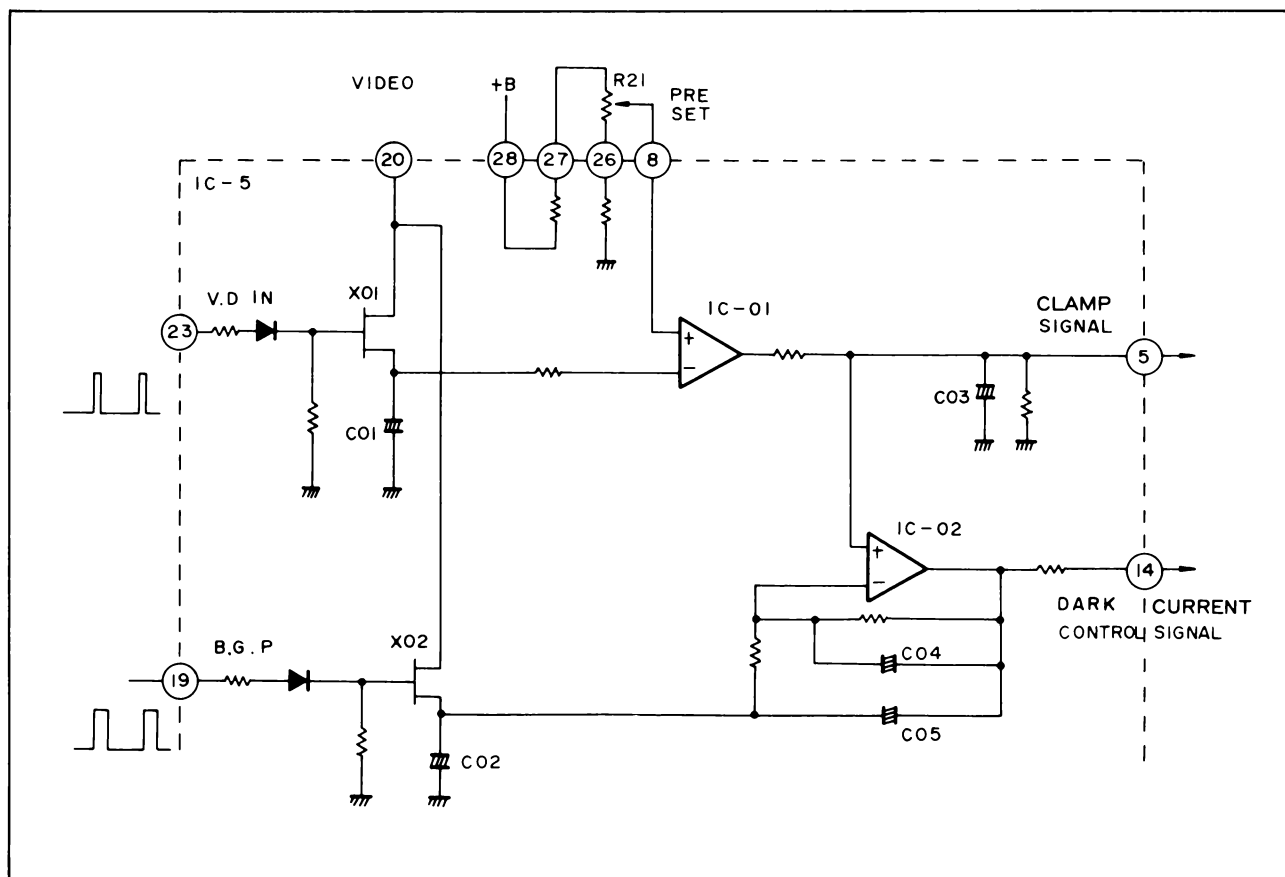


Fig. 2-11

In IC5, the video signal is applied to the drain of X2, while the black gate pulse goes to the gate. The FET becomes ON with application of the black gate pulse, at which time the black mask portion output voltage (dark current) charges C2. This charge voltage goes to

the minus terminal of IC2, while the vertical sync component clamp voltage goes to the plus terminal. Output of IC2 varies in order to equalize these two inputs. In this manner, the vertical sync and black mask (dark current) components become equal.

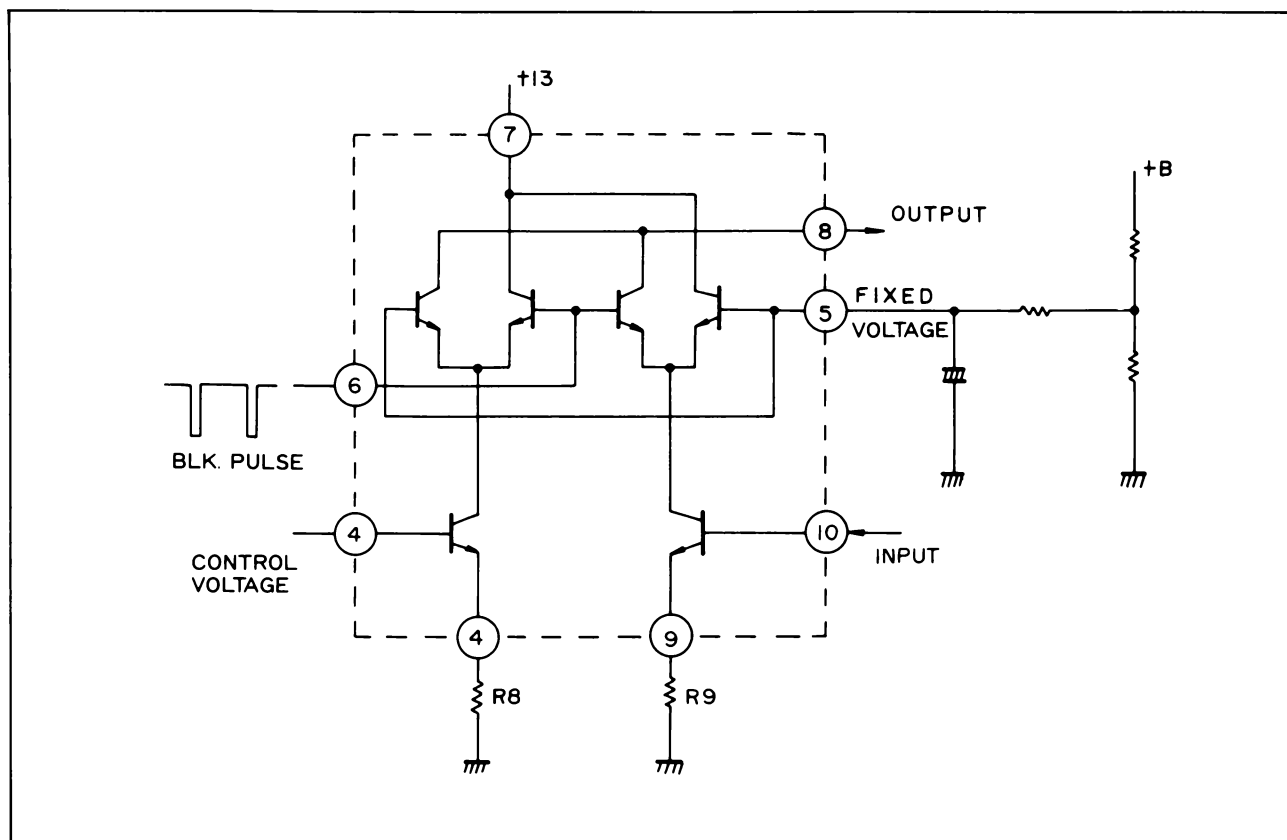


Fig. 2-12

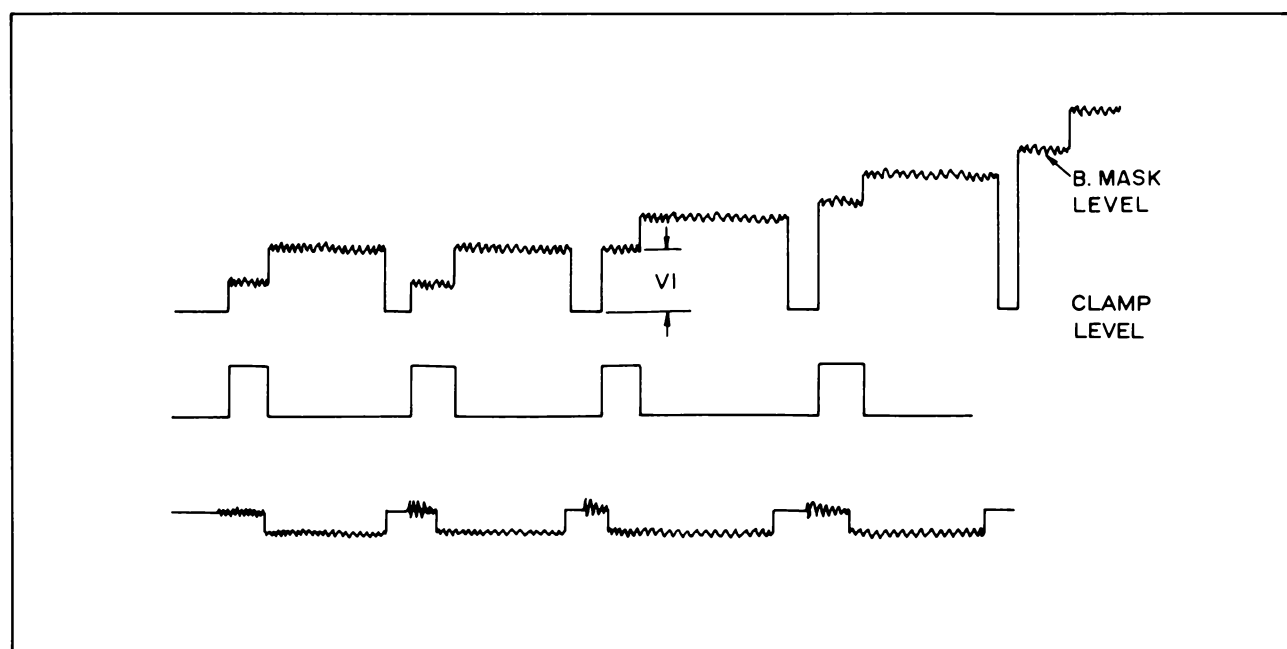
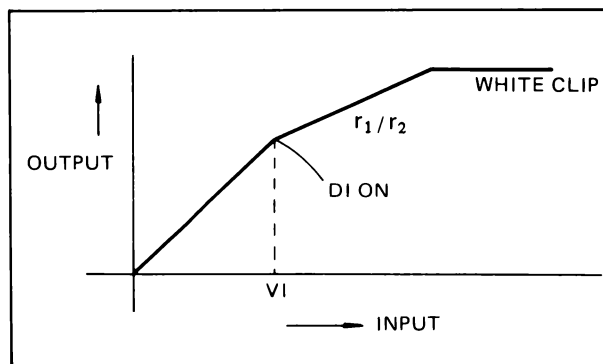


Fig. 2-13

The luminance signal goes to pin 19 of IC3 and is obtained at negative polarity from pin 22 (TP-2). This signal is again divided in three directions: main luminance signal, signal for degamma correction in the chroma circuit, and luminance signal (Y.L.) for NTSC matrix modulation.

In the luminance processing system, R26 performs gamma setting and this midpoint voltage is applied to IC6 pin 24. The base voltage of Q3 in IC6 determines the emitter voltage and a voltage proportional to R26 setting appears at pin 23.

From IC3 pin 1 the video signal is applied to the base of Q1 in IC6 and when this base voltage exceeds the gamma setting voltage, D1 of IC3 becomes ON. This has the effect of dividing the signal voltage by R1 of IC3 and R2 of IC6. In other words, the gamma correction voltage becomes the voltage of IC6 pin 23, while the correction slope is the voltage dividing ratio of R1 and R2.



2-8

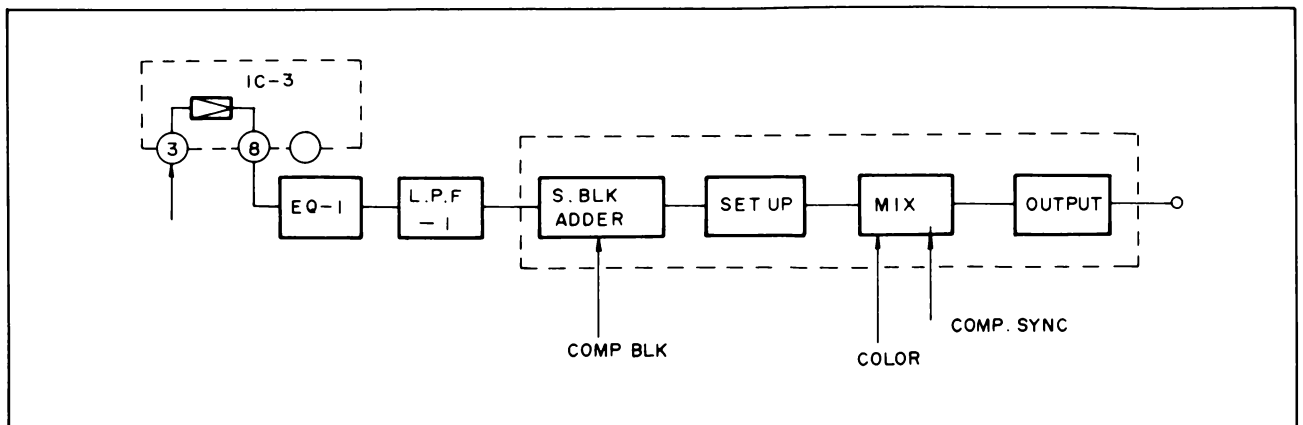


Fig. 2-16

EQ-1 is a type of delay element. The delay amount is approx. $0.5 \mu\text{sec}$, and this is used to match the overall time of the color signal through the narrow band color circuit and the luminance signal through the luminance circuit. LPF-1 passes the luminance component below approx. 3.0 MHz from the vidicon composite signal output.

Through the lowpass filter, the luminance signal goes to IC4 pin 2. It is applied as a negative level input and amplified by Q1. R15 adjusts white clipping and sets the voltage at which Q2 becomes ON.

At Q1 collector, the video signal is at positive polarity and Q2 becomes ON from the white peak direction of the video signal. Q3 and Q4 form a differential amplifier and R16 (Y SETUP) adjusts Q4 current.

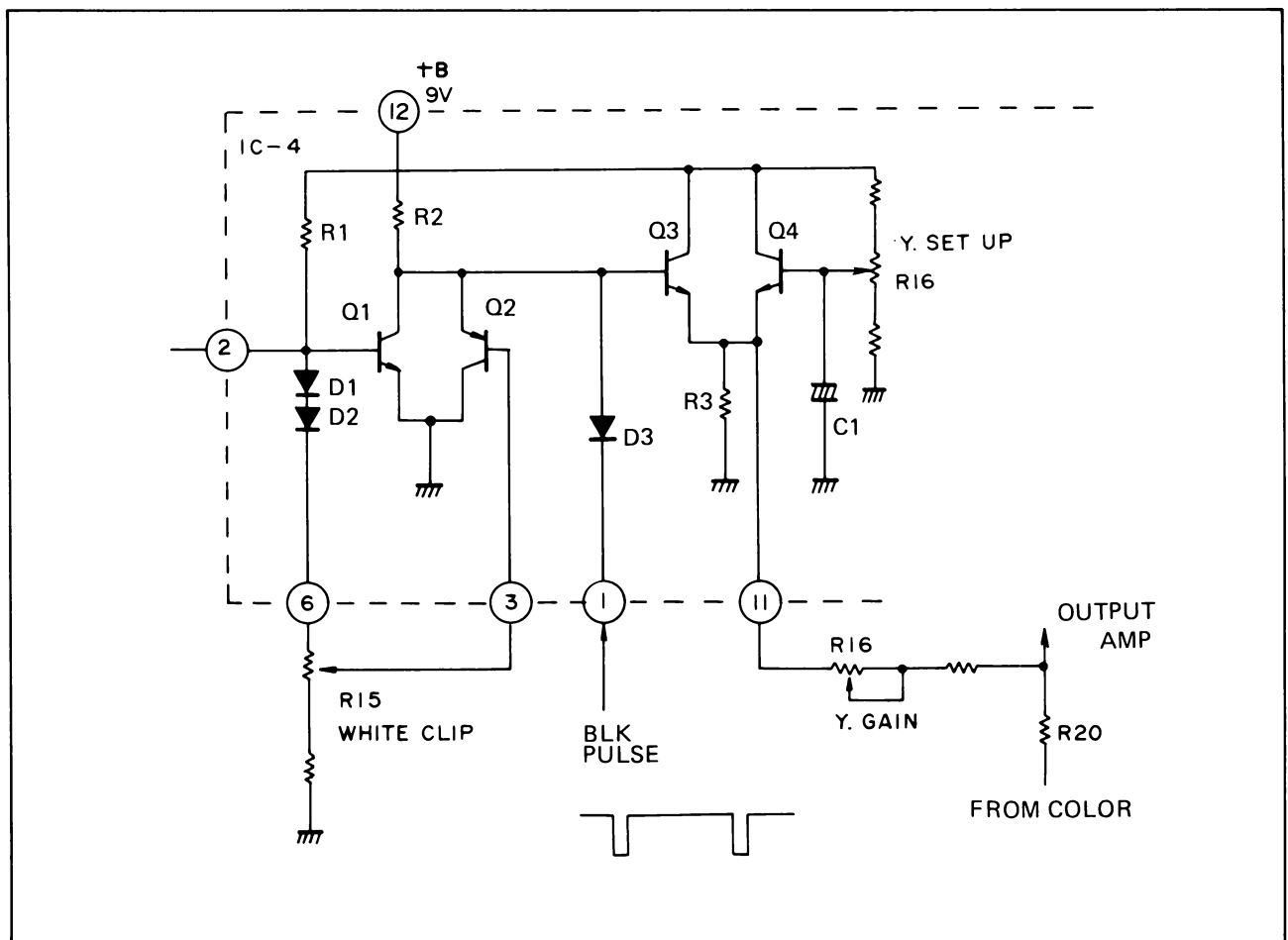


Fig. 2-17

C) Video output circuit

The video signal is applied to Q5 emitter. The output current flows in a manner which equalizes the voltages of Q5 collector and Q6 emitter. In absence of a connection to the camera output terminal, Q6 emitter current goes to Q5 base and both Q5 and Q6 become OFF.

D) Color process

The color signal through a 3.58 MHz BPF goes to the buffer and phase shift circuits of IC7, from which 90° and 270° phase shifted signals are obtained from pins 9 and 7. Delay time of the delay line is approx. 1H (about $64 \mu\text{sec}$). This time has been selected for aligning the amounts of phase shift and obtaining optimum color separation.

The red signal is separated from the signal through the delay circuit and the 90° shifted signal, while the blue is separated from the delayed signal and the 270° shifted signal. Trimmers C12 (B. PHASE) and C13 (R. PHASE) adjust the phase shift amounts for best color separation. See Fig. 2-19.

Since the circuits of IC9 – IC12 (B. Separation) and IC15 – IC18 (R. Separation) are the same, only the IC19 – IC12 circuit is described below.

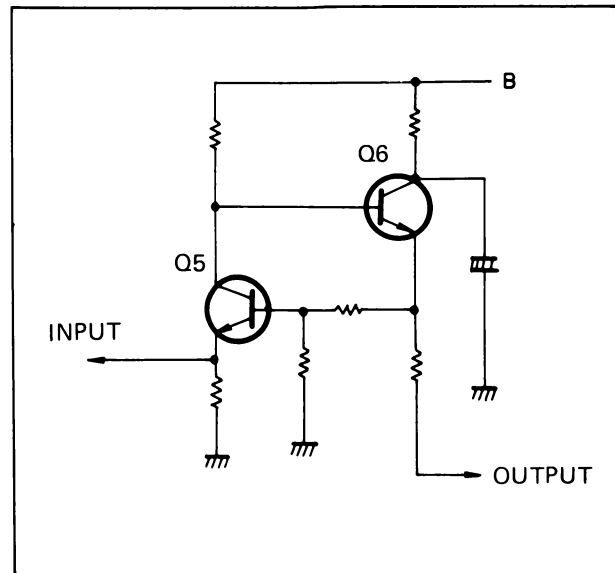


Fig. 2-18

IC9 is a balanced modulator. The phase shifted color modulated signal is applied to pin 3, 1H delay color signal to pin 2, color temperature bias to pin 5, and shading voltage to pin 1. A simplified diagram of these connections is shown in Fig. 2-20.

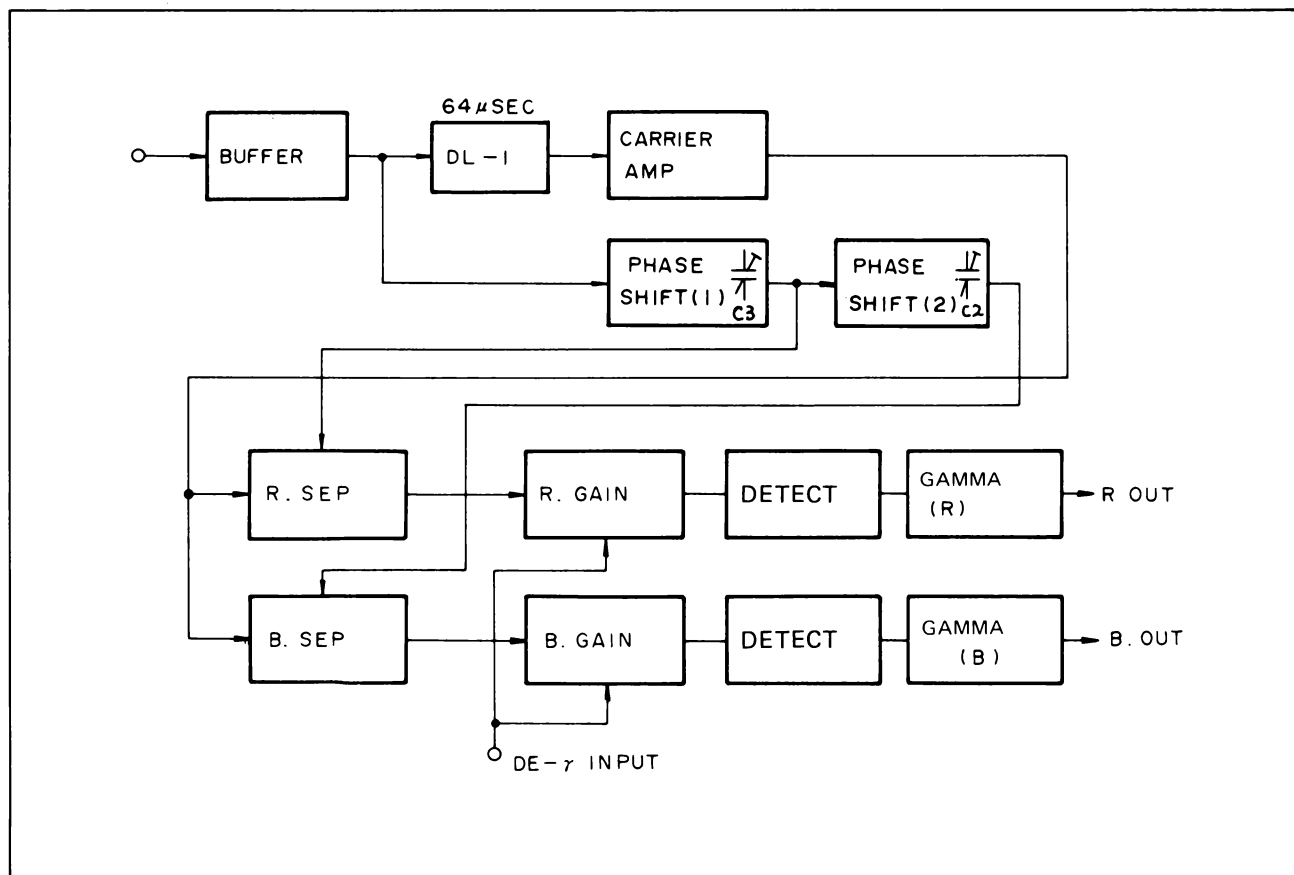


Fig. 2-19

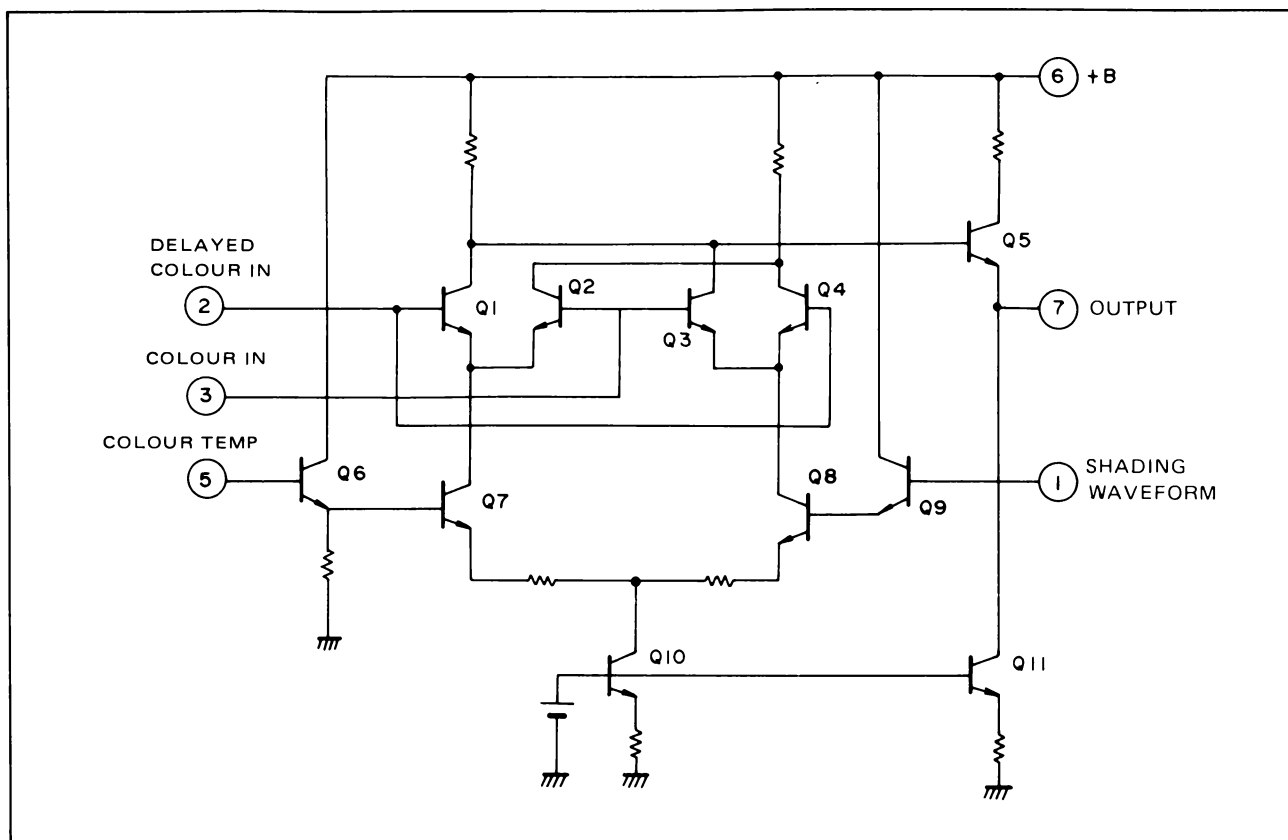


Fig. 2-20

The 1H delayed color signal and the phase shifted color signal are applied to two inputs of the differential amplifier, in which subtraction is performed. Total current is determined by Q7 and Q8. Control voltage from the color temperature switch and the shading waveform are applied to these transistors to perform shading compensation.

• Degamma correction

Generally, when the incident light striking the vidicon increases, the gamma value decreases. Fig. 2-21 shows the relationship between the unmodulated luminance and modulated color signal. As can be noted from the figure, as the amount of light (brightness) increases, overlapping of the signals becomes lost. In order to compensate, the red and blue modulated signals are extended by the luminance signal which has passed through a non-linear circuit. This adjustment improves white balance in the white portions of the picture and increases the dynamic range.

IC10 (AN612) is also a balanced modulator; input is pin 3 and output is pin 7. Degamma control input is applied to pin 1. Degamma functions to compensate for variations in color modulation due to changes in brightness of the camera subject.

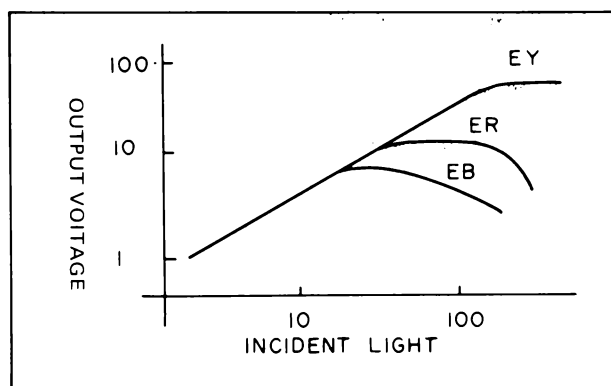


Fig. 2-21

E) Detector circuit

A synchronous detector is employed for IC11 (μ PC596C). The circuit principle is illustrated in Fig. 2-22 and Fig. 2-23.

3.58 MHz modulated color signal is applied to pin 7 of IC11. Q8 functions as an emitter-follower and the inverted signal at Q15 base is obtained from Q15 collector. Q15 and Q16 form a differential amplifier and the same phase signal as Q15 base is obtained from Q16 collector. Consequently, 180° phase difference signals appear at the collectors of Q15 and Q16. These are limited by diodes D1 and D2, then supplied to Q11 and Q12.

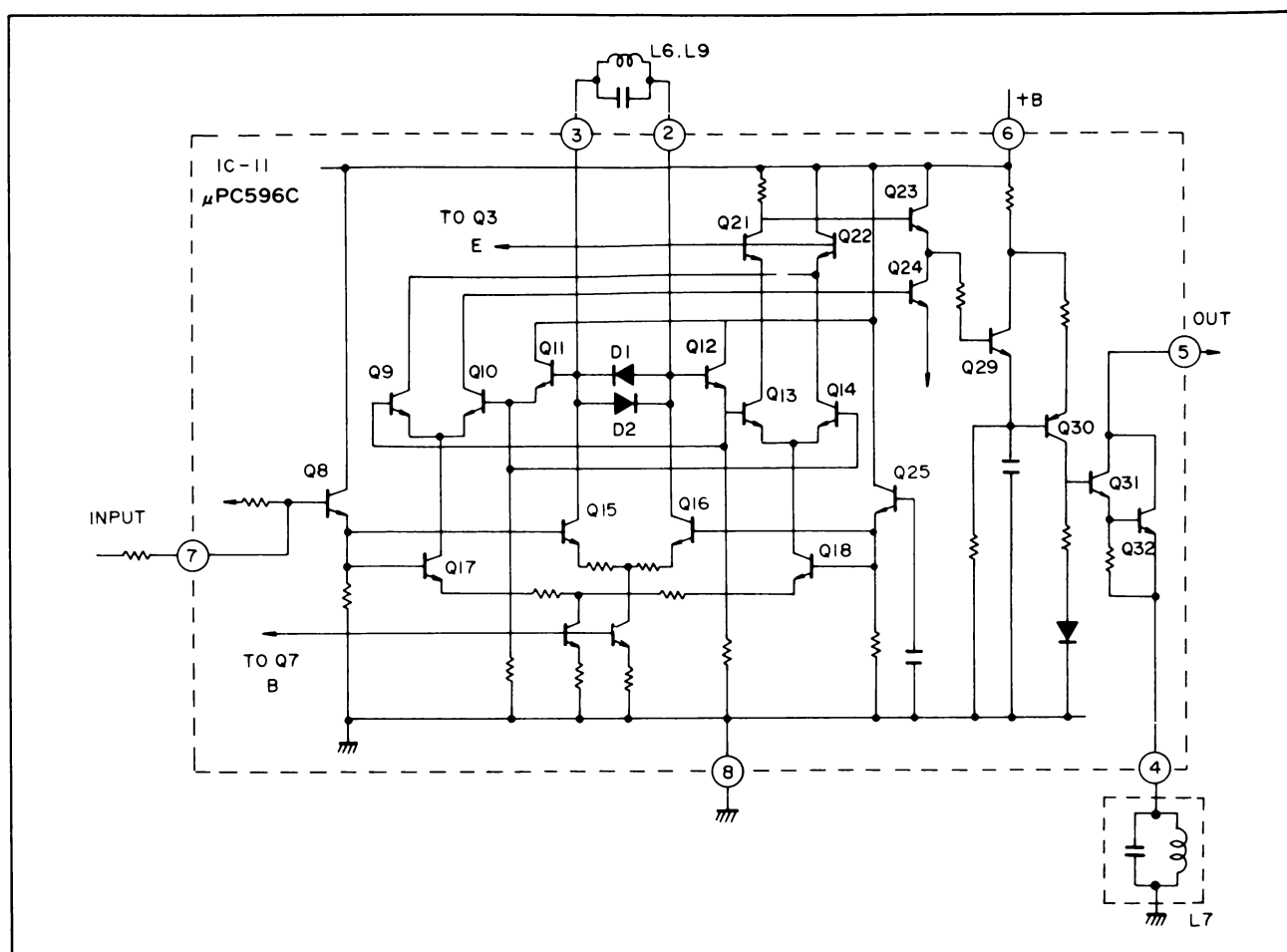


Fig. 2-22

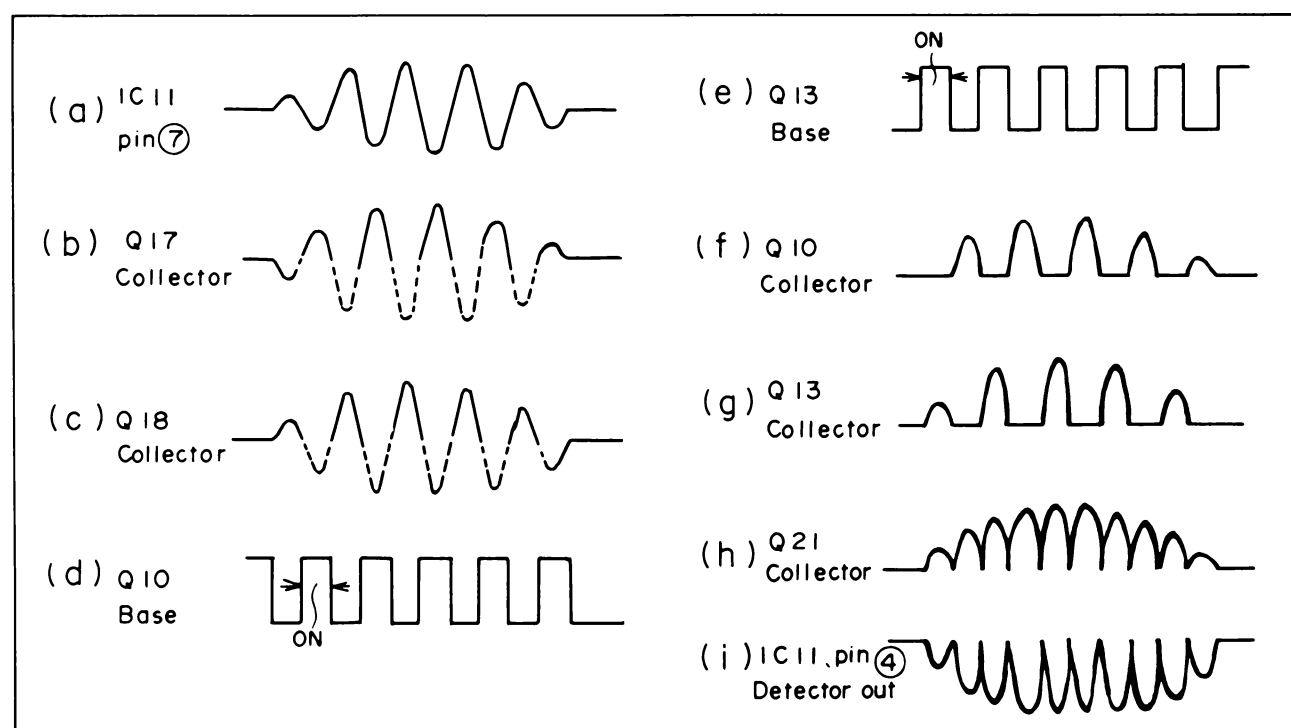


Fig. 2-23

In the limiter, the resonance points of coils L6 and L9 (PU30770-4) appear very strongly at 7.16 MHz, which is twice the modulated color frequency. At other frequencies, L6 and L9 become conducting.

Q8 emitter signal goes to Q17 base and an inverted chroma signal is obtained from Q17 collector. Since Q17 and Q18 form a differential amplifier, opposite phase signals become obtained from their collectors. These signals are limited by Q10 and Q13 to produce a 7.16 MHz squarewave.

The detector output from Q24 base goes to Q29 – Q32, then to pin 4, where a filter circuit removes the chroma modulation carrier. The detector circuit is a synchronous type which features superior linearity.

Extraneous color signals produced in the sync portions of the red and blue color signals are removed by composite blanking, after which gamma correction is applied.

The detector output is applied to IC12 pin 2. Gamma correction point is set by R55, which varies the base voltage of Q3 in IC12 and the set voltage appears at Q3 emitter. When the video signal from the detector circuit exceeds this set voltage, D1 becomes ON, connecting gamma control R58 in parallel with Q1 base.

Since an approx. 500 kHz color signal bandwidth is sufficient for picture reproduction, lowpass filter LPF-3 and LPF-4 remove unnecessary color components.

Color difference signals (R-Y and B-Y) are produced from the gamma corrected color signals by employing luminance and the burst flag pulse from the SSG. The color signal is applied to the emitter of Q1 in IC12, while luminance is applied to its base. Consequently, the

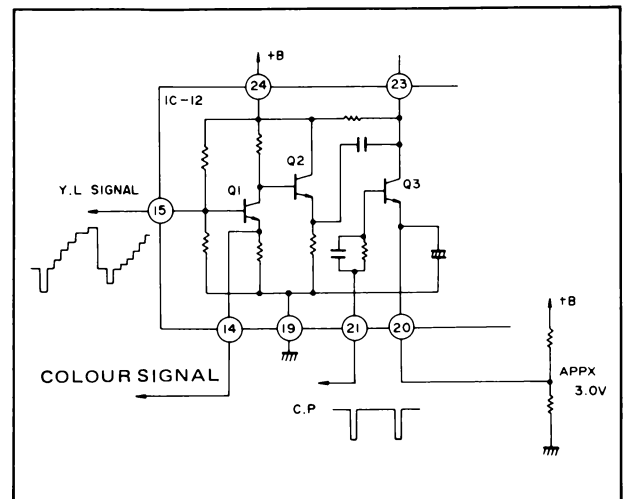


Fig. 2-25

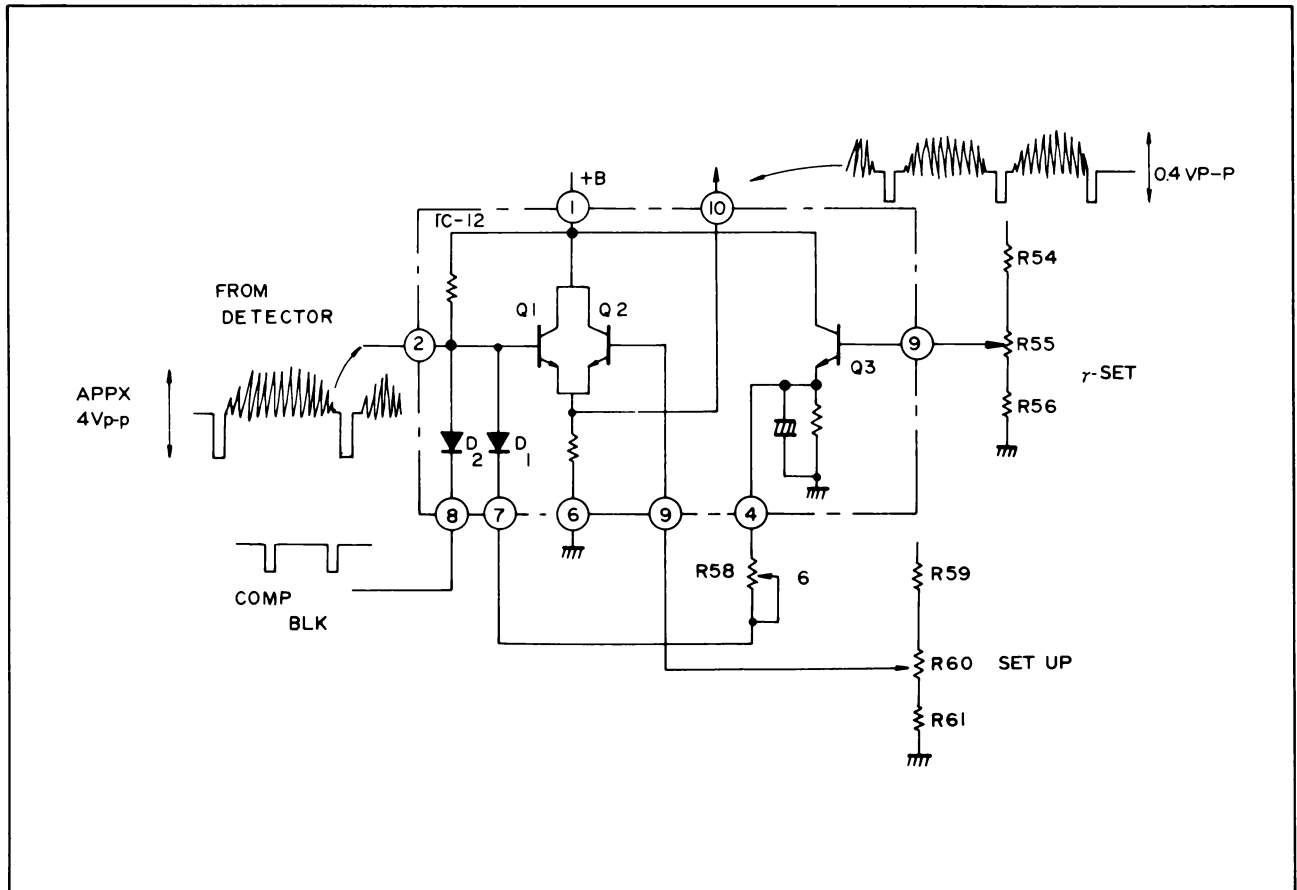


Fig. 2-24

collector is at the same phase as the emitter, and the base at opposite phase, thus producing the color difference (B-Y) signal. After amplification by Q2, the clamp pulse at Q3 is applied to restore the DC component of the color signal.

The color difference signals (R-Y and B-Y) are applied to a balanced modulator for quadrature modulation and become the color carrier signal. Fig. 2-26 shows the principle of the balanced modulator circuit. The 3.58 MHz subcarrier goes to the bases of Q1 and Q4, while the B-Y signal is applied to the base of Q6. The B-Y signal can be zero, positive or negative. Operations in these cases become as follows.

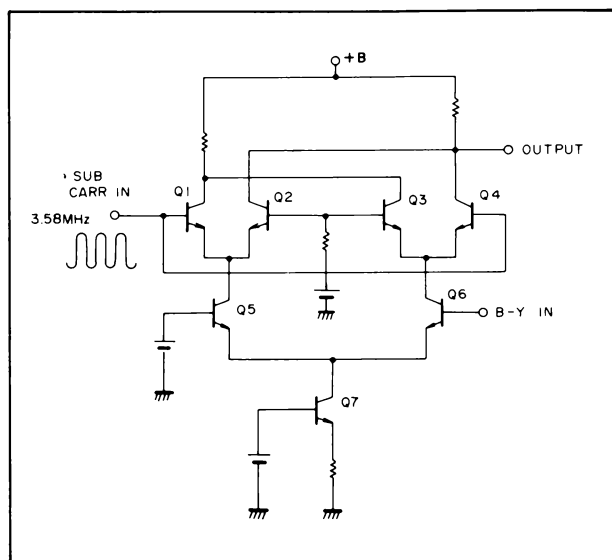


Fig. 2-26

B-Y zero:

Since the circuit is designed to equalize the B-Y signal clamp level and Q5 base bias, the currents in Q5 and Q6 become equal. The 3.58 MHz subcarrier is applied to the bases of Q1 and Q4. At the collector outputs of Q2 and Q4, the 3.58 MHz subcarrier components are precisely at opposite phase and no output is obtained.

B-Y positive:

Q5 and Q6 form a differential amplifier and when Q6 is ON, Q5 is OFF. In this state, Q4 becomes ON with the subcarrier positive component. When B-Y is positive, B-Y becomes obtained in proportion and in reverse phase to the subcarrier.

B-Y negative:

In the Q5 and Q6 differential amplifier, Q5 becomes ON when Q6 is OFF. With a positive subcarrier applied to Q1, Q2 becomes OFF and the subcarrier output is obtained in proportion to B-Y.

In the same manner, the R-Y signal is balance modulated with the 3.58 MHz subcarrier at IC19 (AN614). The modulated R-Y and B-Y signals are applied to the terminals of R71 ENCODER BALANCE control, from which the output is obtained at the center point.

A comb filter improves the S/N of the resulting color signal, after which it is supplied to IC14 chroma amplifier. In this circuit, when the density of the color signal approaches white, the color signal amplification is variable by the luminance signal in order not to exceed the NTSC value. Peak amount is set by R73. Afterwards, color and luminance signals are combined to become the video output signal.

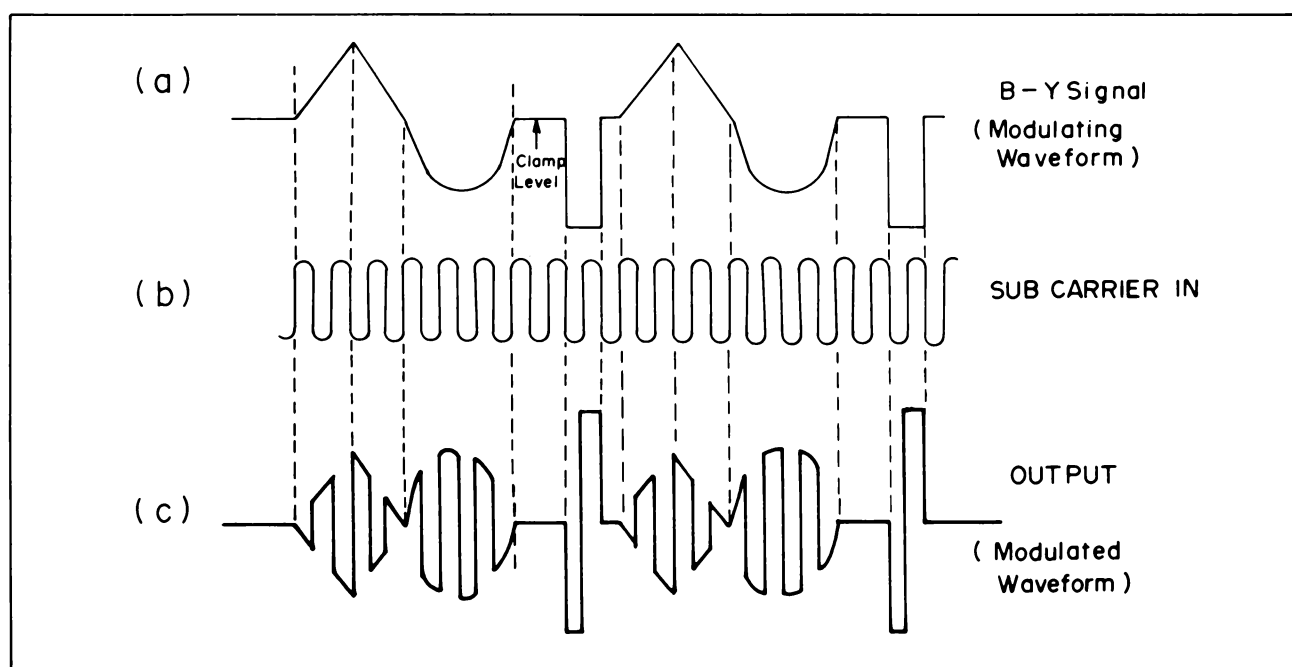


Fig. 2-27

2-5 DEFLECTION AND HIGH VOLTAGE CIRCUITS

The deflection and high voltage circuits function to provide proper operation of the vidicon. Precise horizontal and vertical deflection are especially important in this camera in order to obtain correct color separation. The main circuits are described below.

2-5-1 Horizontal deflection

The horizontal deflection circuit supplies sawtooth current to the deflection coil. For practical purposes, at the horizontal scanning frequency, the deflection coil can be viewed as a pure inductance element. Therefore, the basic design of this circuit is to provide optimum efficiency in supplying a sawtooth waveform to a nearly pure inductance.

Fig. 2-28 shows the equivalent circuit. At time t_1 , when switch S closes, current flows in the coil. This current is proportional to the deflection coil inductance and becomes amplified exponentially. When switch S opens at t_2 , the coil current does not rapidly decline, but instead, oscillation becomes produced by an LC resonance circuit.

After 1/4th cycle of the resonance frequency, the coil current becomes zero, during which time the switch voltage becomes maximum. The current then flows in the opposite direction and reaches negative peak 1/2 cycle later. In this manner, the LC circuit oscillation repeats when the switch becomes OFF. However, in practice, the negative cycle is cut by a damper diode and the oscillation rapidly stops.

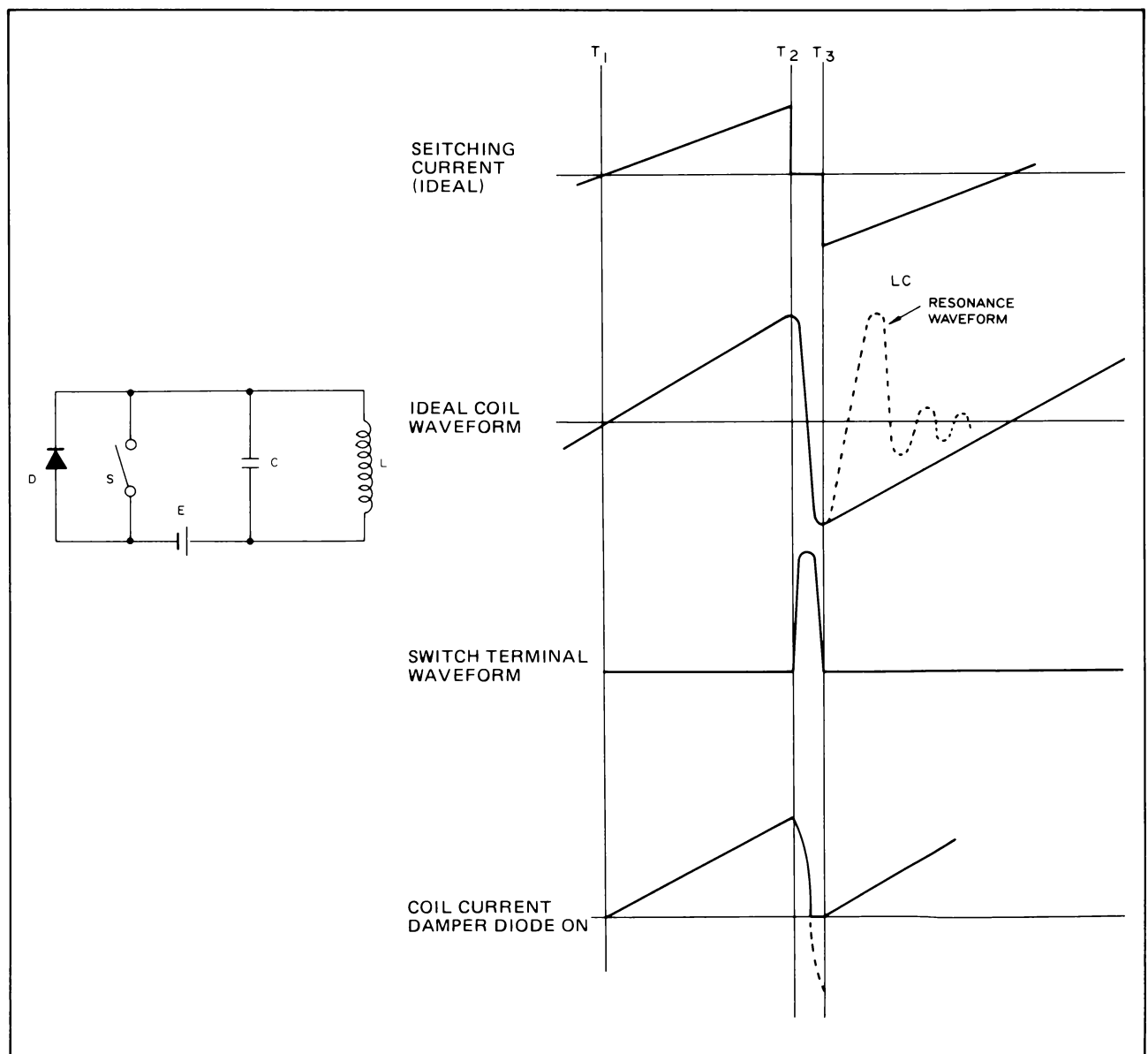


Fig. 2-28

An amplifier which directly produces the sawtooth waveform from the power source is employed in the camera deflection circuit, thus improving the linearity of the current flow in the coil. The equivalent circuit of this section is illustrated in Fig. 2-29.

Transistor X1 is used for switching and functions to switch the sawtooth wave current in the deflection coil

after amplification by IC1. During the horizontal sweep period, X3 is ON and the current from IC1 flows in the circuit comprised of R14 → deflection coil → C4 → X3. X3 is OFF during the retrace period, at which time the deflection coil and C3 form a parallel resonance circuit and D1 becomes a damper diode via coil T2. The timing chart of the horizontal deflection circuit is shown in Fig. 2-30.

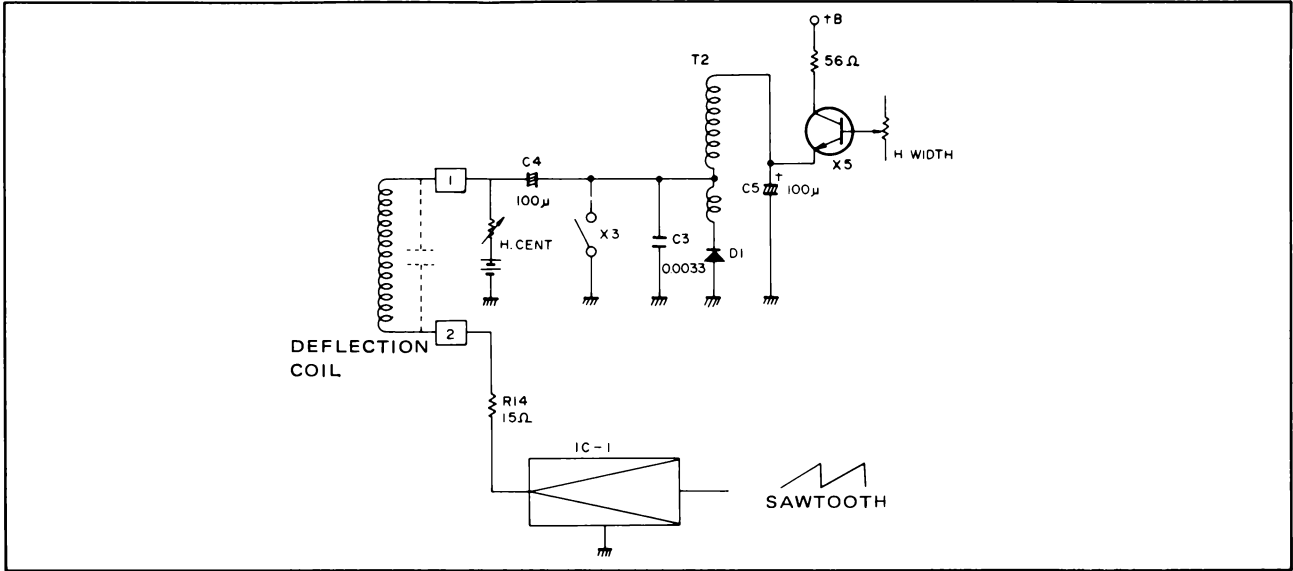


Fig. 2-29

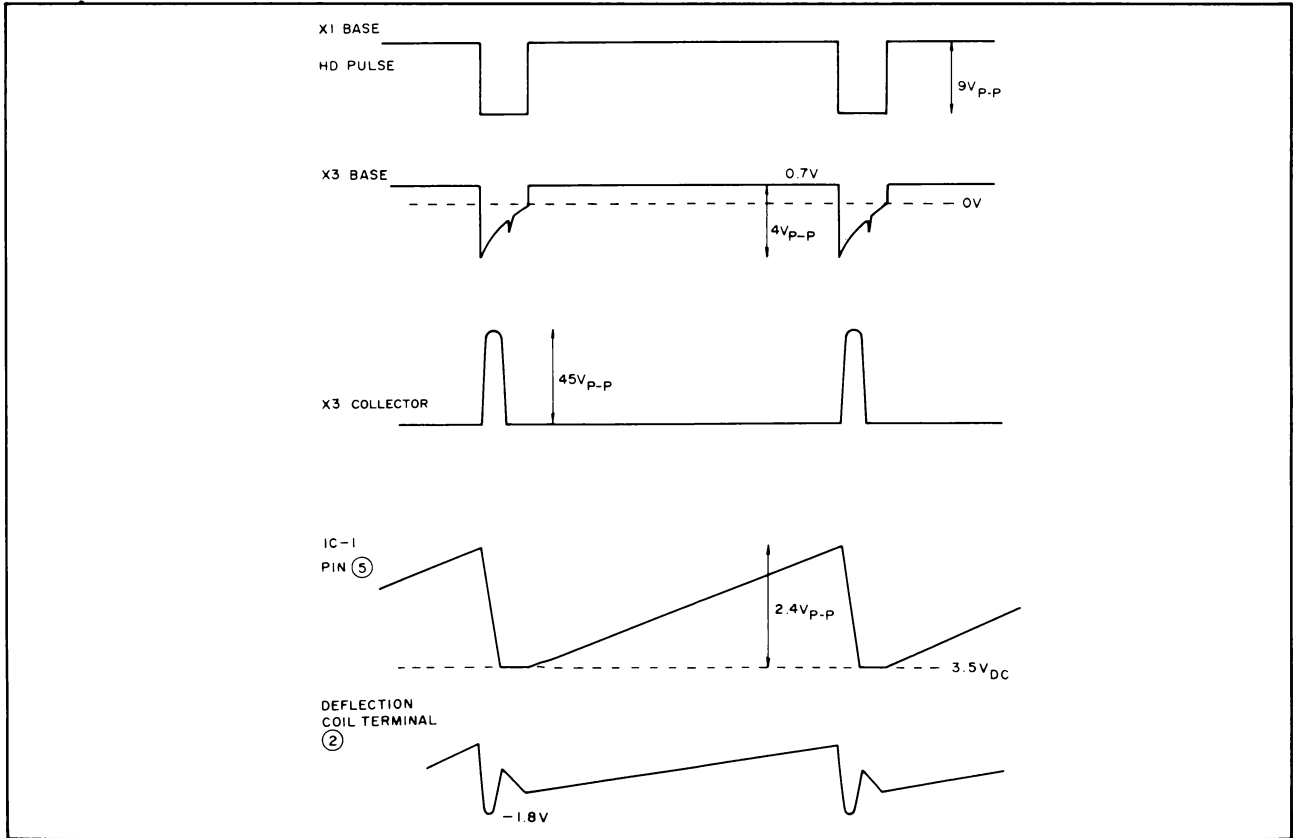


Fig. 2-30

2-5-2 Vertical deflection circuit

At the vertical scanning frequency, the vertical deflection coil can be considered as only a resistance component. The vertical deflection circuit supplies sawtooth current to this coil.

Distortion becomes produced when the sawtooth signal from the output amplifier flows in the coil. In order to compensate for this, it is necessary to apply feedback to the amplifier and thus introduce a counteracting parabolic distortion.

A) Sawtooth generator circuit

IC5 (D328W21) produces the sawtooth wave from the vertical sync signal. The equivalent circuit of this IC is shown in Fig. 2-31.

In absence of the vertical drive (VD) pulse, PNP transistor X1 is cutoff. At this time, C1 and C2 become charged to the power supply voltage via R3. The base of X2 is HIGH while charging current is flowing in C1 and C2. At completion of charging, X2 base is grounded through R3 and becomes LOW.

When the VD pulse is present, X1 becomes ON, and C1 and C2 are discharged through X1. Afterwards, C1 and C2 again begin charging. As shown in Fig. 2-31, this charging current declines exponentially and the voltage produced at both ends of R3 also declines exponentially.

The exponential voltage is obtained from X2 emitter and supplies feedback via R5. This compensates the exponential curve and yields a sawtooth waveform with good linearity.

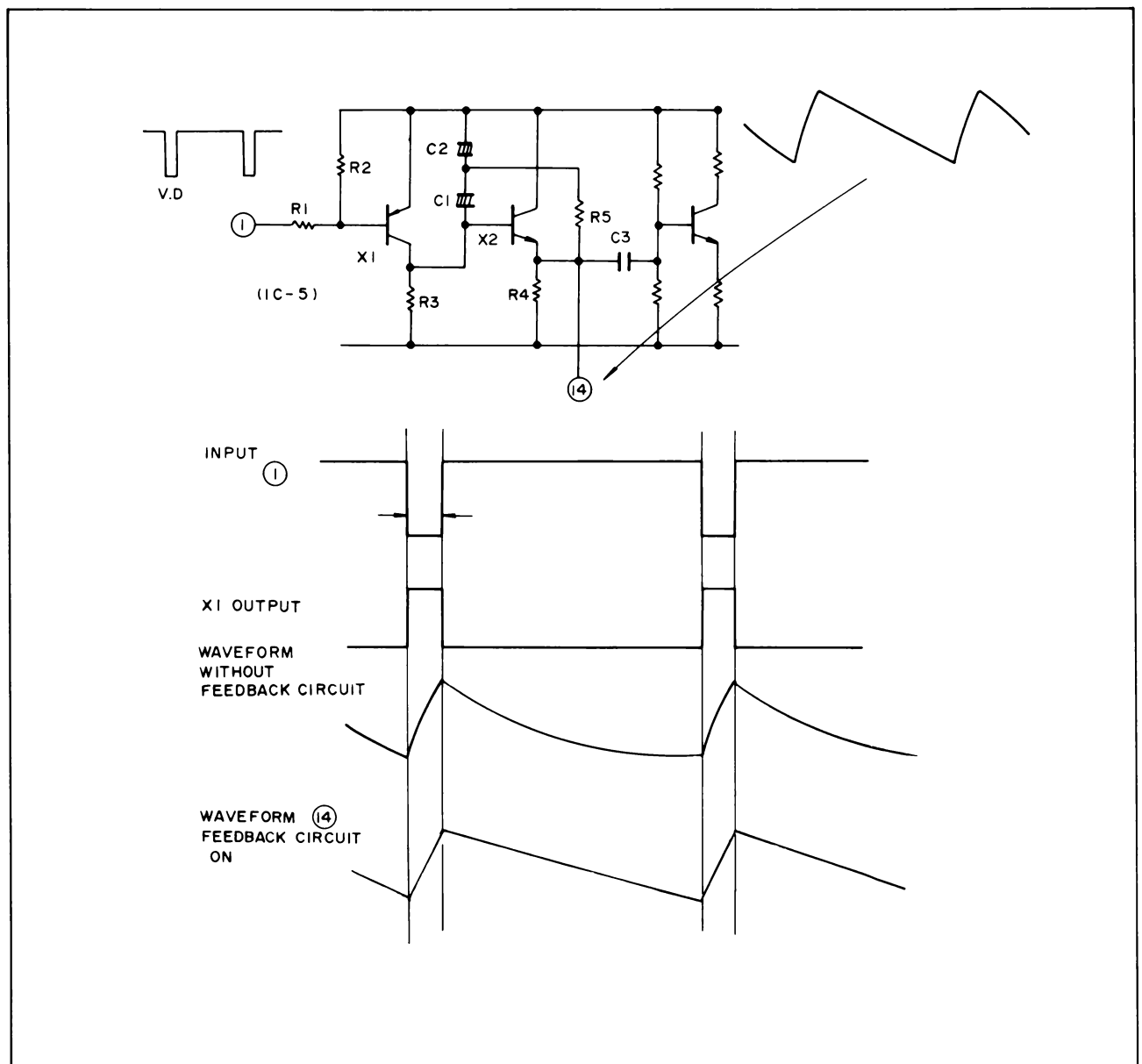


Fig. 2-31

B) Vertical output circuit

The sawtooth waveform voltage goes to pin 2 of IC2 (AN374P) and this output is connected to the deflection coil. Distortion is produced in the waveform when it flows through the coil and reverse compensating voltage must be applied. Feedback from the output is therefore applied to pin 3 via R24 (V. LIN).

Vidicon dark current is compensated by applying the black scan pulse (BSP) to the deflection voltage for scanning the black mask portion of the vidicon. Period of the BSP is approx. 1.2 msec, which corresponds to approx. 18H. This system is indicated in Fig. 2-32.

C) High voltage circuit

A maximum of about 1300 V is required for the vidicon target and focus functions. An approx. 7.8 kHz square-wave is employed as a switching pulse and the high voltage becomes produced by DC to DC conversion.

In the circuit diagram (Fig. 2-33), X6 and X7 are switching transistors. The switched waveform goes to setup transformer T2 (PU47954) and the resulting AC voltage becomes rectified and supplied to the vidicon.

2-5-3 Auto iris circuit

The iris functions by a galvanometer consisting of drive and damping coils. Continuous variation is provided from F1.9 to F36. The iris circuit is shown in Fig. 2-34.

Normally, the drive coil is controlled by a voltage integrated from the video signal and supplied from the video process board. Immediately after supplying power, the video output is absent, since the vidicon heater has not reached operating temperature. During this time, less than 3.5 V is supplied to the iris control input pin 8.

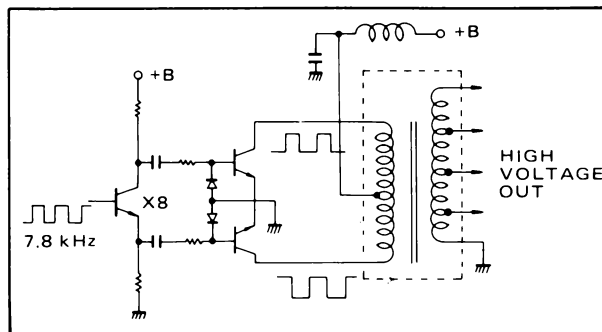


Fig. 2-33

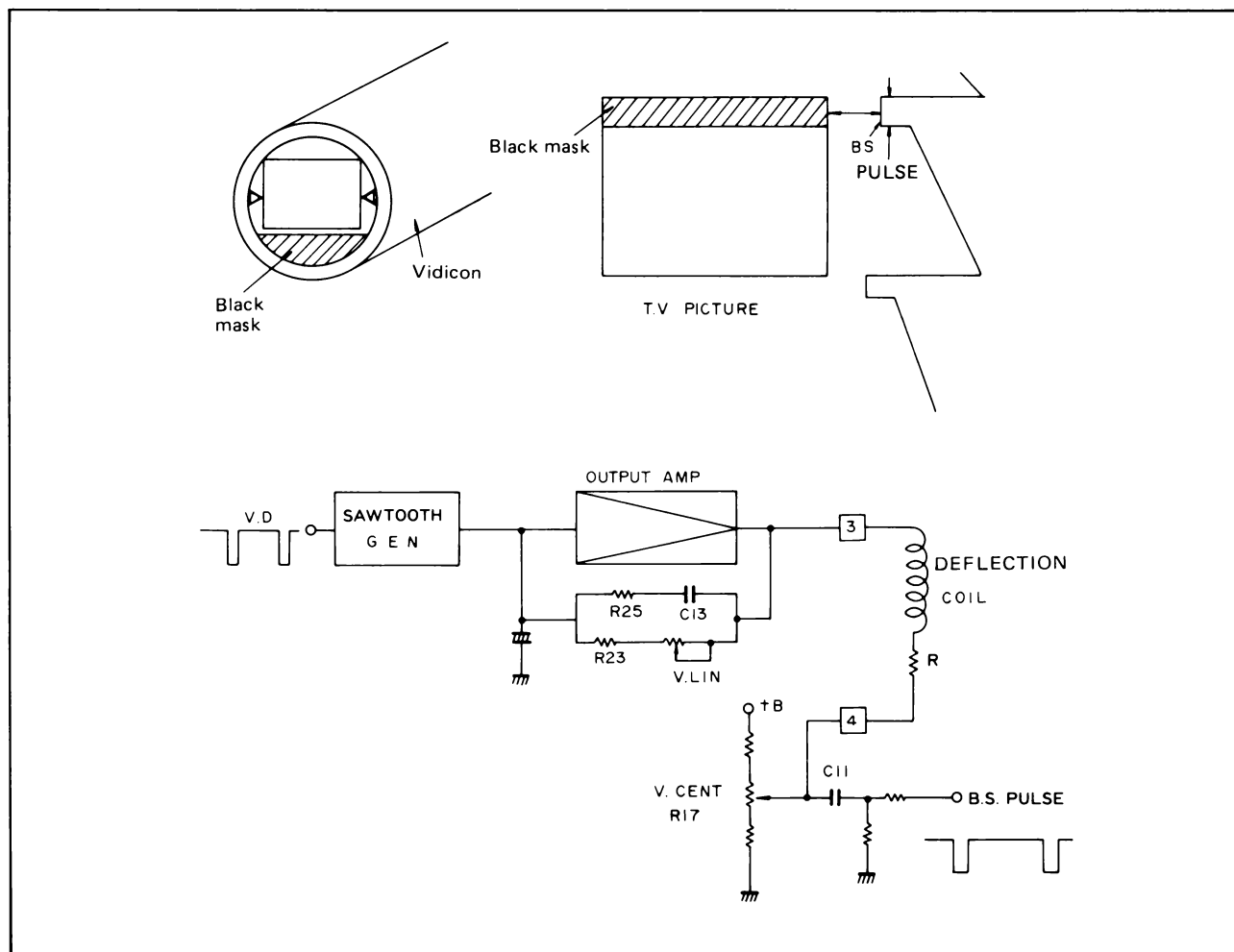


Fig. 2-32

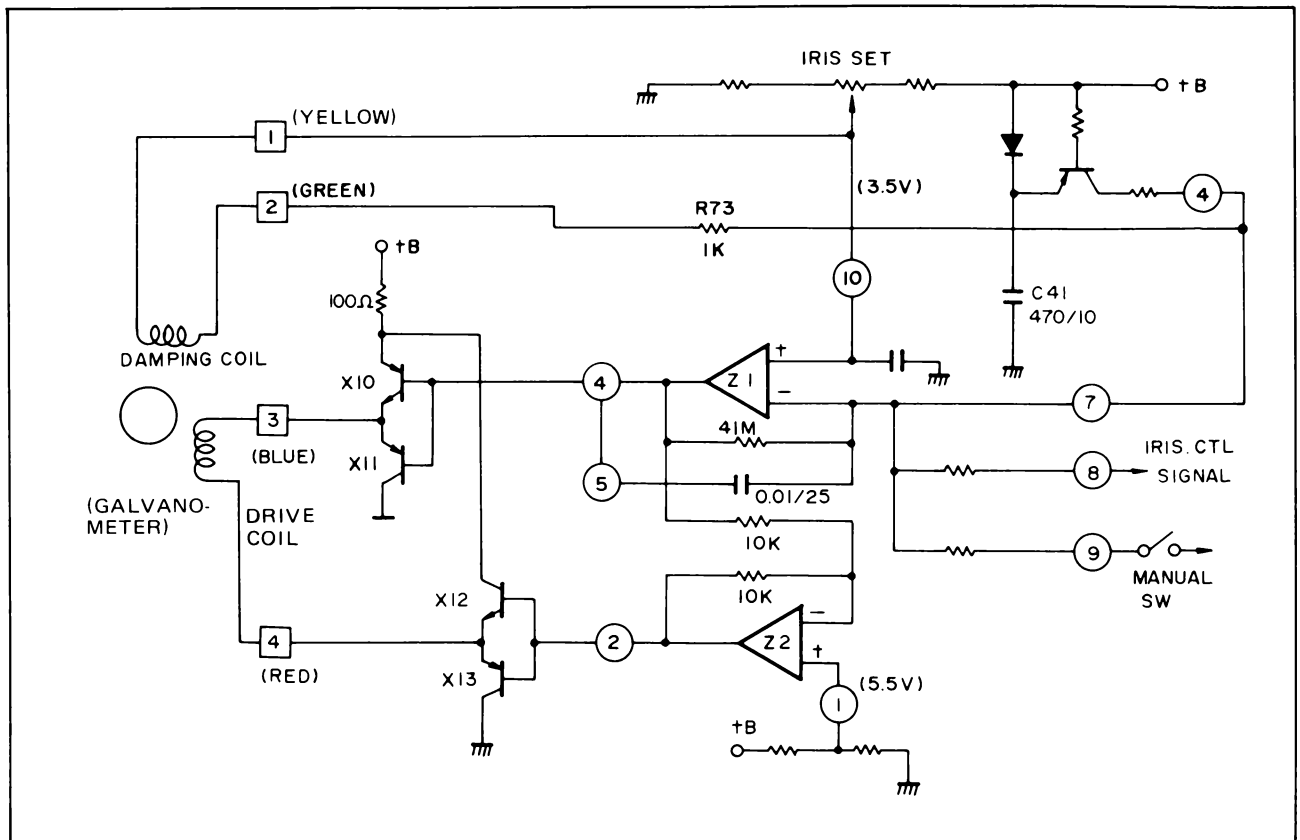


Fig. 2-34

The IRIS SET control adjusts for approx. 3.5 V. When the minus input of operational amplifier (opamp) Z1 is LOW, the output increases to the power supply voltage. At this time, transistor X10 is ON, X11 OFF and HIGH voltage is applied to galvanometer pin 3.

Resistors divide the power source voltage and approx. 5.5 V is supplied to the plus terminal of opamp Z2. Since the HIGH output of opamp Z1 goes to the minus terminal of Z2, the output of Z2 becomes LOW. X13 becomes OFF, X13 ON and pin 4 of the galvanometer is grounded. At this point, coil current flows from pin 3 to pin 4 of the meter and the iris opens.

When the iris control (CTL) signal exceeds the iris set voltage, the meter current flows from pin 4 to pin 3, and the iris closes.

Consequently, the auto iris circuit functions to maintain equal voltage between the video signal (iris CTL) and the iris set voltage and automatically varies the iris.

2-5-4 Battery alarm circuit

When the START/STOP (trigger) switch is set to ON, the recording LED (light emitting diode) in the viewfinder normally lights steadily. However, as the voltage supplied to the camera declines below approx. 11 V, this LED flickers to serve as a battery alarm. The signal for this indication is produced by the alarm circuit shown in Fig. 2-35.

Power supply (battery) voltage goes through a regulator circuit, then it is converted to 9 V and supplied to the camera circuits. The battery alarm circuit operates from both REG (regulated) 9 V and UNREG (unregulated) 12 V. Normally (when power source voltage is 12 V), C36 (1 μ F 50 V) is charged to approx. 9 V through R66 and R67.

R62 — R64 divide the power supply voltage to supply 9.8 V to the plus side of opamp Z1. Since the plus side potential is slightly higher than the minus side, Z1 operates to maintain an output higher than 9 V. This supplies a plus input to Z2 and Z2 lights the LED.

As the power source voltage declines (due to battery drain), Z1 plus side voltage declines below 9 V. Since the minus side voltage of Z1 then becomes higher than the plus side, the opamp output rapidly declines. C36 then discharges and the output declines to where the plus and minus sides become equal.

When the plus side becomes higher than the minus side, the voltage again increases and C36 begins charging. At the point C36 charge voltage becomes HIGH, the output rapidly decreases. This process repeats and causes the LED to flicker. Waveforms during alarm operation are shown in Fig. 2-36.

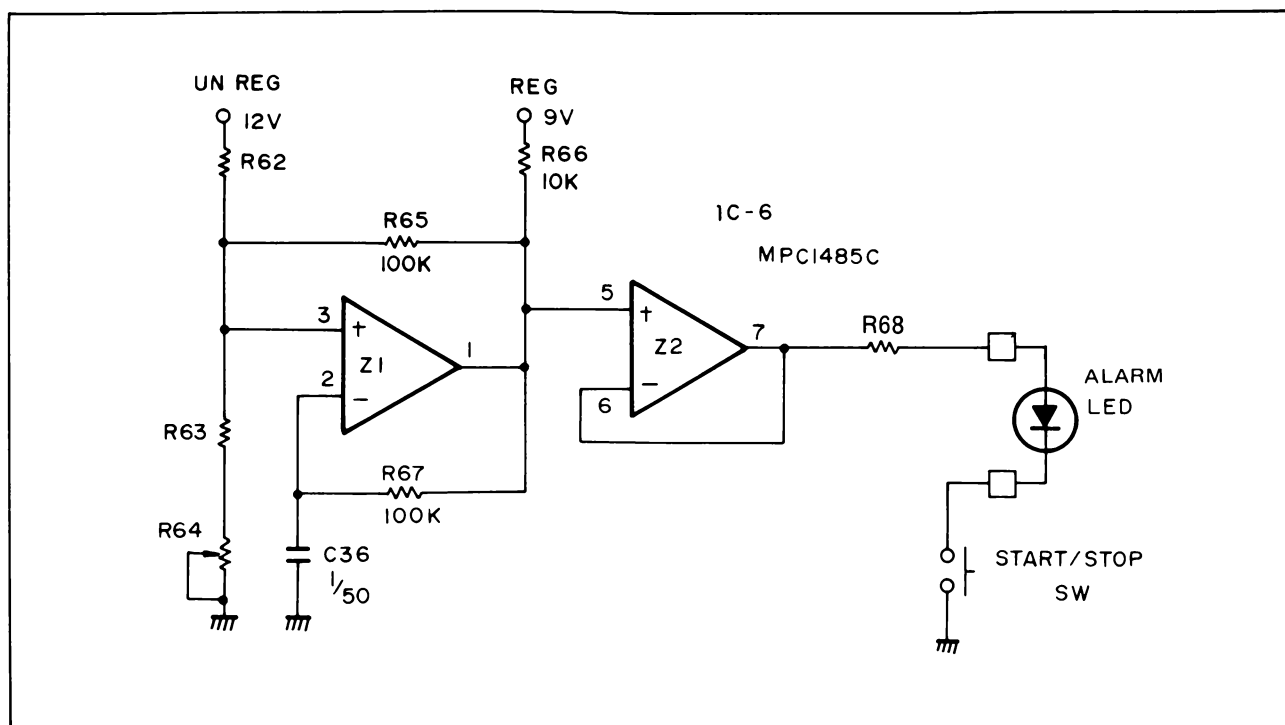


Fig. 2-35

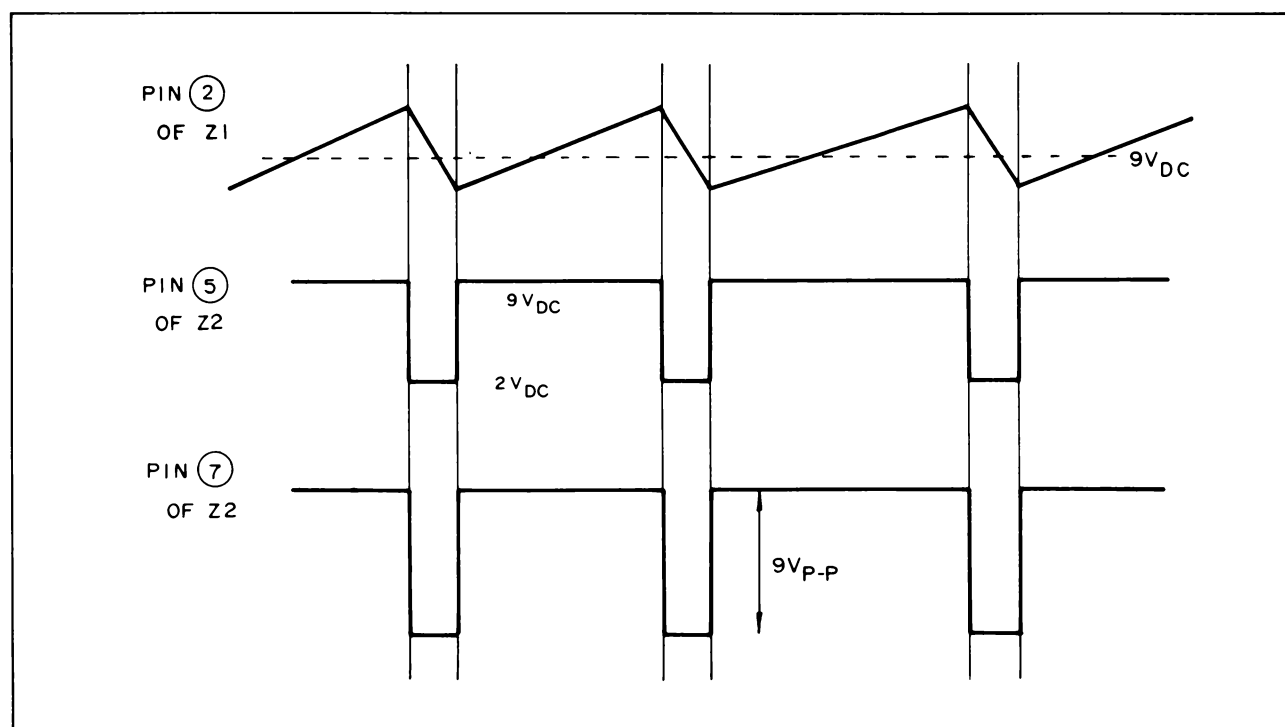


Fig. 2-36

SECTION 3 DISASSEMBLY

3.1 CABINET REMOVAL

1. Remove five screws ① from the cabinet as shown in Fig. 3-1.

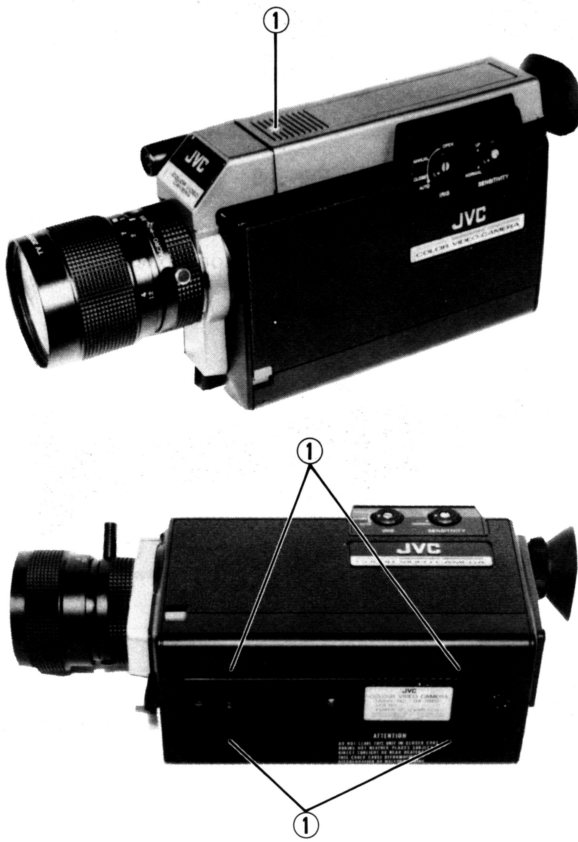


Fig. 3-1

2. Take out two screws ② from the knobs (see Fig. 3-2).

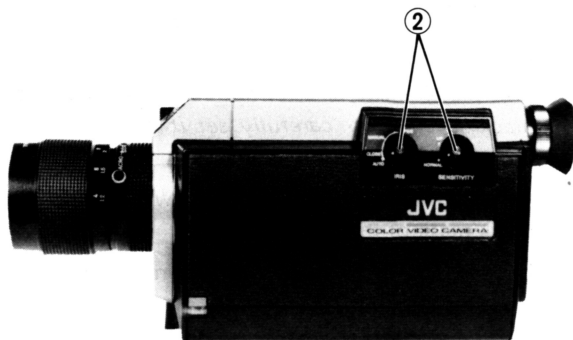


Fig. 3-2

3. Pull off the front panel, top cover, and both side panels.
4. Remove one screw ③; H/DEF PWB can be opened.

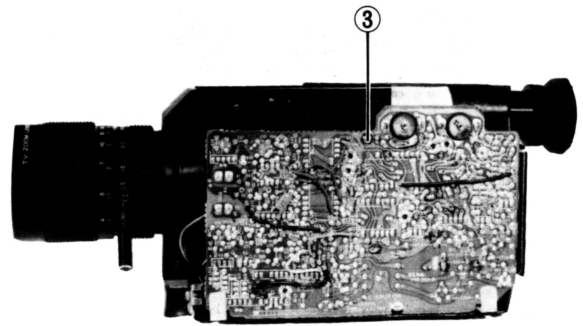


Fig. 3-3

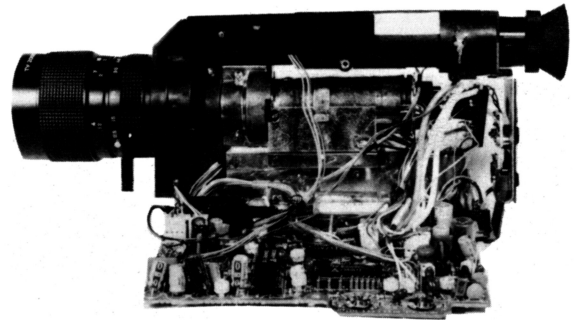


Fig. 3-4

5. Take out two screws ④, the video process and colour comp. PWB can then be removed.

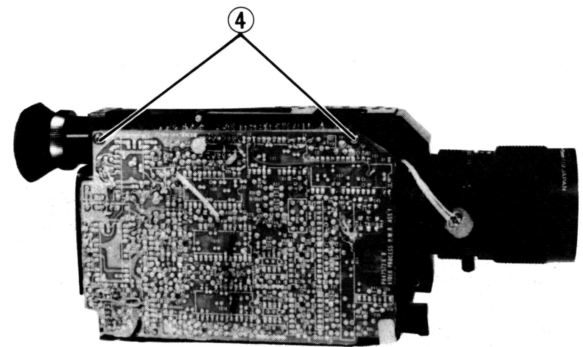


Fig. 3-5 (a)

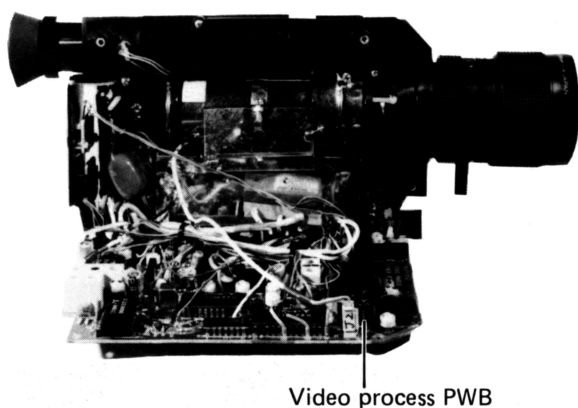


Fig. 3-5 (b)

3.2 VIDICON REMOVAL

1. Unsolder the ground wire of the shield case.
Remove two screws ① from the shield case as shown in Fig. 3-6.

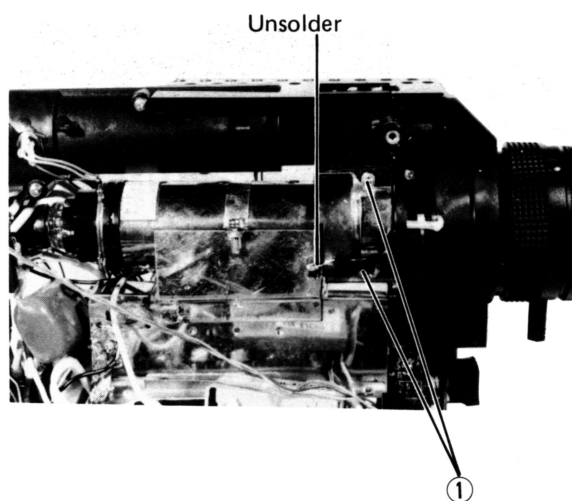


Fig. 3-6

2. Loosen the vidicon screw as shown in Fig. 3-7.

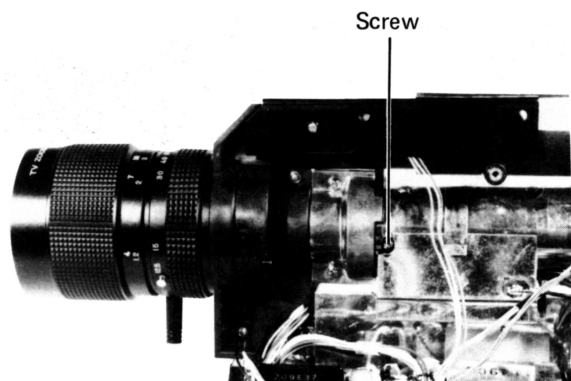


Fig. 3-7

3. Remove the vidicon cover with the shield case.

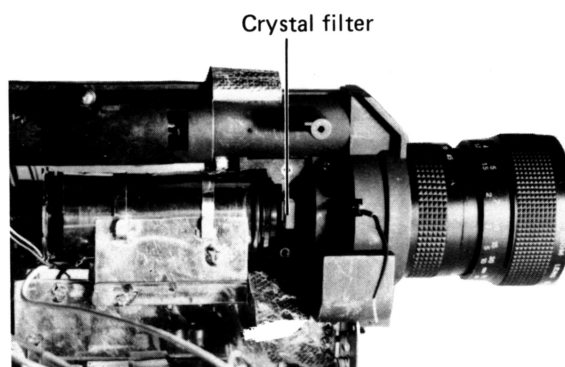


Fig. 3-8

4. Remove the deflection connector and vidicon socket. Pull out the deflection yoke with the pre amp case (including vidicon).

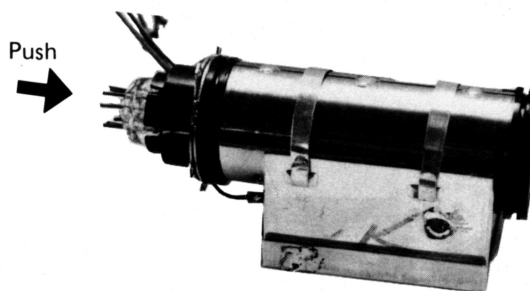


Fig. 3-9

5. Push the vidicon bottom gently and pull out the vidicon from the deflection yoke.

3.3 VIDICON REPLACEMENT

3.3.1

1. Refer to Disassembly (section 3.1) and remove the vidicon.
2. Attach the adhesive black mask (PU47605-1-2) to the new vidicon as shown in Fig. 3-10.

Note:

The black mask is essential for obtaining stable black level. Very carefully set it at the position shown in Fig. 3-10.

- (1) Attached mask should be parallel with the internal black mask of the vidicon.
- (2) Upper edge of the mask is positioned 2.9 ± 1 mm from the center mark.
- (3) After installing, be sure to perform electrical checks. Observe that the black mask does not appear in the picture. Pick up a bright subject

(which covers the upper portion of the picture area) and check for absence of colour phase and level variations.

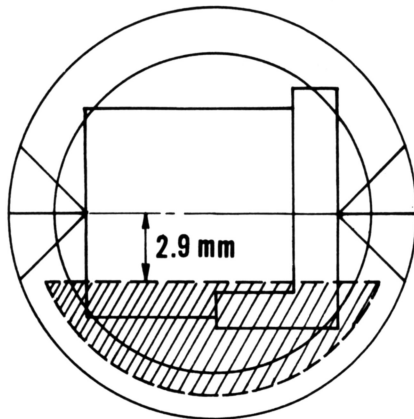


Fig. 3-10

3. Vidicon and deflection yoke position is very important when installing a new vidicon.

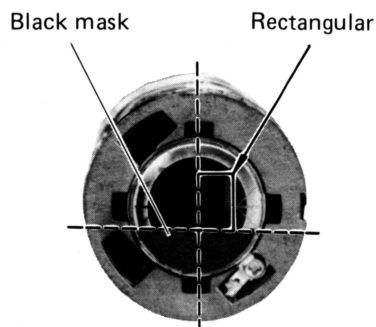


Fig. 3-11

4. Reassemble the camera (reverse the steps of Disassembly) to the point the vidicon cover is installed, then temporarily produce a picture.

NOTE:

The following adjustments are considered "standard". However, note that the values given may vary slightly according to the individual characteristics of the vidicon and camera deflection yoke.

3.3.2 Rotation adjustment

Before performing the following steps, perform the electrical adjustments up to section 4, step 4.3.9.

1. Pick up a white pattern and adjust for suitable iris opening.

2. Connect oscilloscope to TP-6 of the VIDEO board and observe the 3.58 MHz color subcarrier in the horizontal sync (TV-H) mode of the oscilloscope.
3. Loosen the vidicon clamp screw.
4. Carefully rotate the vidicon socket together with the vidicon to obtain the flattest waveform at TP-6 as shown in Fig. 3-12.

Caution:

High voltage circuits are located in this area.

5. Tighten (but not fully) the vidicon clamp screw.

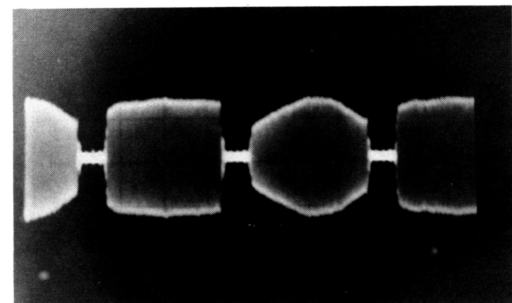
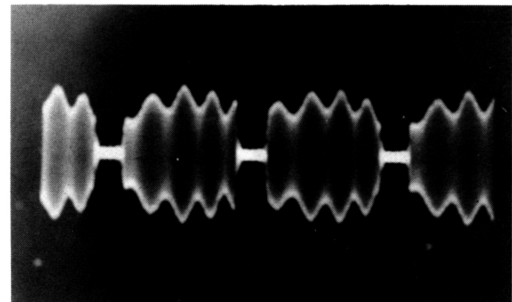


Fig. 3-12

3.3.3 Alignment

1. Pick up a red pattern (red poster paper) or a white pattern through a red filter (V-R61). Adjust the lens iris for 0.75 Vp-p at VBS OUT.
2. Adjust for zero shading waveforms at TP-4 and TP-5 of the H/DEF board (see section 4).
3. Connect oscilloscope to TP-12 of the VIDEO board. Adjust the position of the alignment magnet to obtain the flattest waveform.
4. Observe the picture on a monitor and confirm absence of colour unevenness.
5. If unevenness cannot be eliminated, increase the shading voltage.
6. After adjusting for the optimum point, again check the rotation. Then tighten the vidicon clamp screw fully.

7. Pick up a white pattern and confirm absence of colour unevenness.

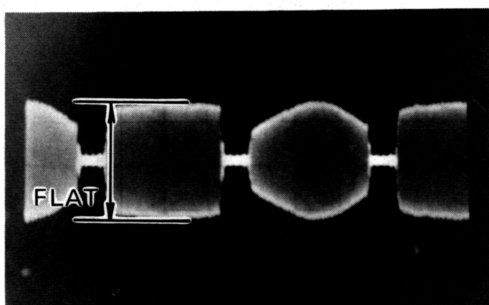
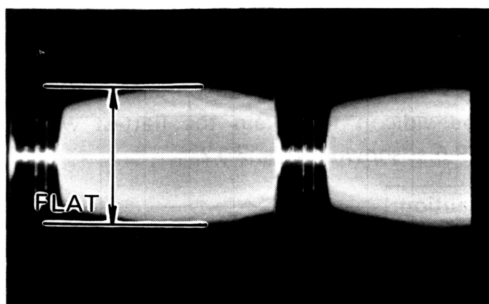


Fig. 3-13

SECTION 4 ADJUSTMENT

4.1 TOOLS AND BASIC CONNECTIONS

4.1.1 Instruments and tools for camera adjustment

1. Reflecting type greyscale (GS-2)
2. Light fixture (halogen light)
3. Colored glass filters (V-42, V-R61)

4.1.2 Required test equipment

1. Color monitor (capable of underscan)
2. Camera adapter (GA-22E or GA-41E)
3. Oscilloscope (dual-trace with delay function)

4.1.3 Other recommended equipment

1. Light meter (with lux scale)
2. Air blower
3. Lens cleaning tissue
4. Gauze and alcohol
5. ND (neutral density) and color temperature filters
6. Skin tone pattern

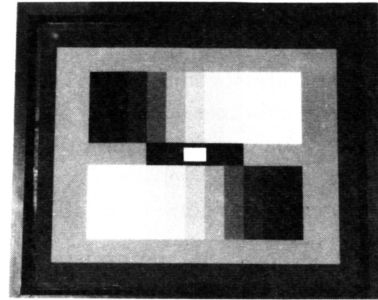


Fig. 4-1 (a)

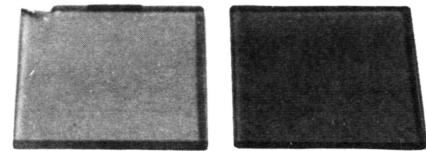


Fig. 4-1 (b)

4.1.4 Basic Connection Diagram

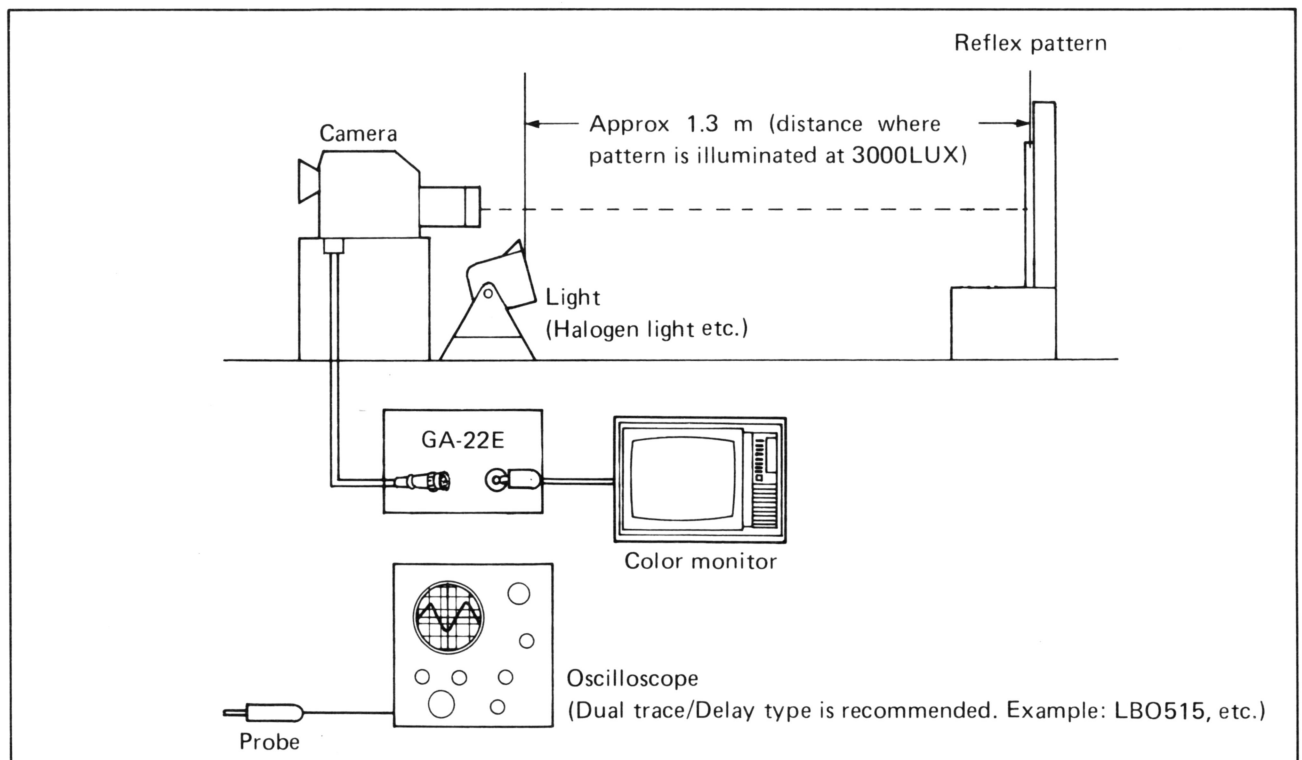


Fig. 4-2

4.2 PREPARATION AND CHECKS

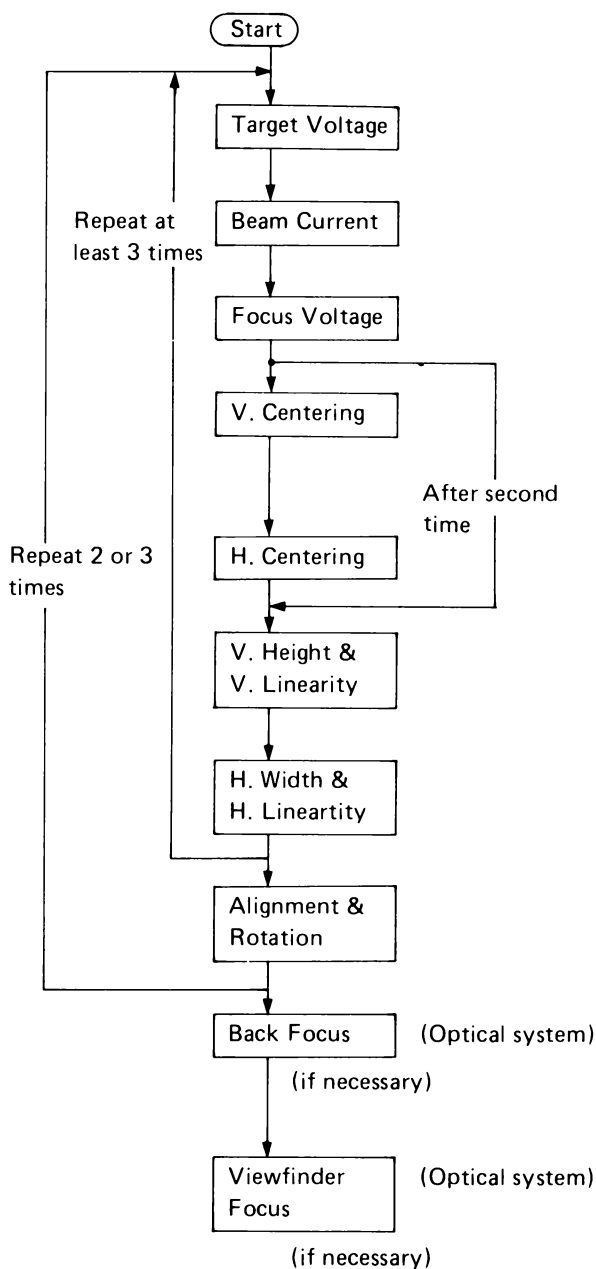
4.2.1 Precaution

1. Use a 3000°K light fixture. Set the light source so that the pattern is illuminated uniformly at more than 3000 K.
Note that correct adjustments cannot be performed with improper lighting.
When using the earlier light box (5100° K) for the GC series cameras, employ color temperature conversion filters to convert for 3000° K.
2. Supply 9 V power to the camera and allow the camera to warm up for at least 10 minutes before proceeding with adjustments.
3. Trigger the oscilloscope from the following test points.
 - a) H rate: TP-3 (DEF/HV board)
 - b) V rate: TP-5 (VIDEO board)
4. **Before adjusting, check that the color temperature switch is set to INDOOR.**

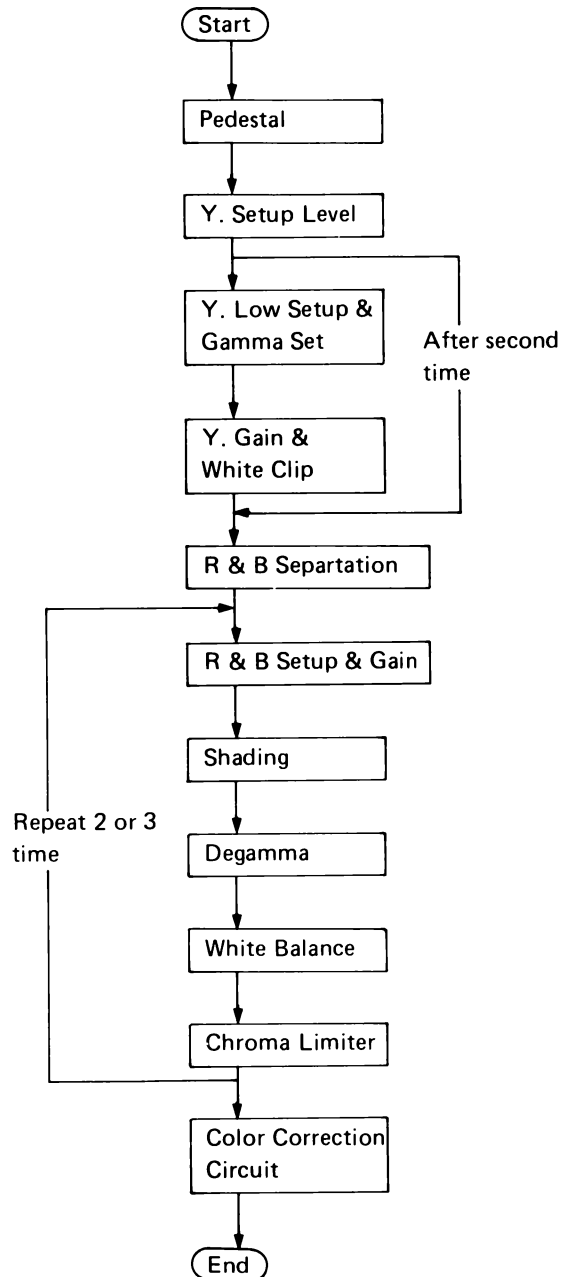
Note: The standard adjustment procedures are described in the following. Due to such factors as differing characteristics among individual pickup tubes and deflection yokes, the numerical values given may vary somewhat during actual service. Therefore perform adjustments for the optimum points.

4.2.2 Adjustment flowcharts

A. DEFLECTION SYSTEM

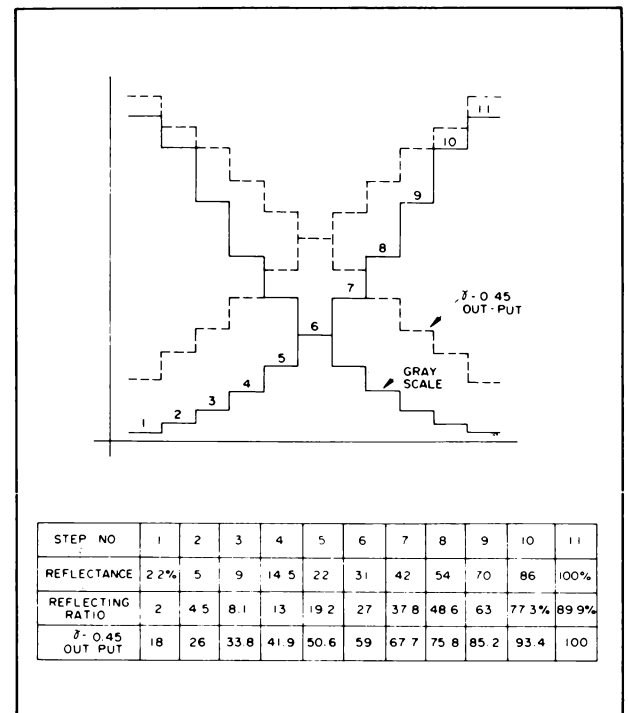


B. SIGNAL SYSTEM

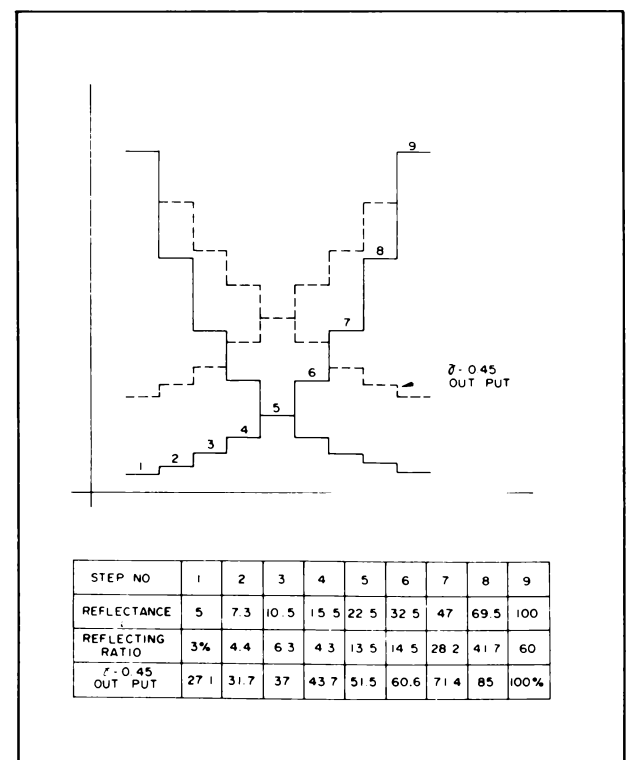


4.2.3 Test pattern

The JVC type γ -2.2 gray scale chart is used in this manual. If another type of gray scale is used, the waveform should be nonlinear, The EIA Log-type gray scale conversion chart is shown as follows.



γ -2.2 JVC CHART



EIA LOG CHART

4.3 DEFLECTION SYSTEM ADJUSTMENTS

4.3.1 Shading zero setting

Connect oscilloscope to TP-4 and TP-5 of the DEF/HV board. So that shading correction is not applied, adjust R82, R38, R80, R36, R44, R42, R93 and R92 to remove the parabolic and sawtooth waveforms and obtain a straight line, as shown in Fig. 4-3.

4.3.2 Target voltage adjustment

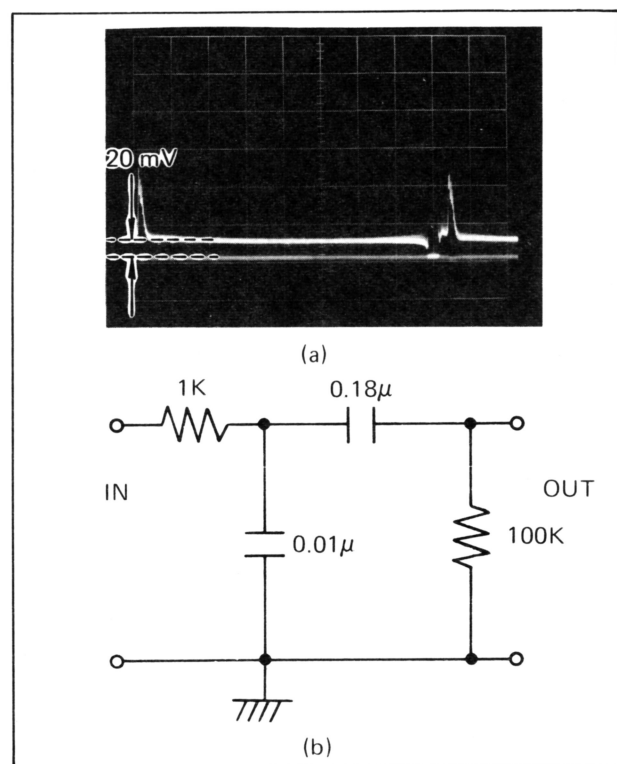


Fig. 4-4

1. Connect oscilloscope to TP-1 of the VIDEO board. Cap the camera lens to cut off the light.
2. Adjust R30 TARGET BIAS of the DEF/HV board for 20 mV dark current.

*The waveform is more easily observed by measuring through a lowpass filter, as shown in Fig. 4-4.

4.3.3 Beam adjustment

With the same set up as above, remove the lens cap and open the lens iris. Turn iris VR to maximum, then turn R74 (IRIS Set VR) of the H/DEF board fully counter-clockwise.

1. Connect oscilloscope to TP-1 of the video board.
2. Adjust R56 (Beam VR) on H/DEF to obtain 0.8 Vp-p video level as shown in Fig. 4-5.

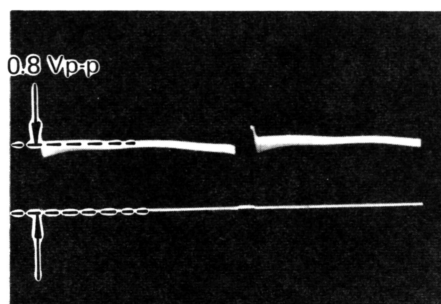


Fig. 4-5

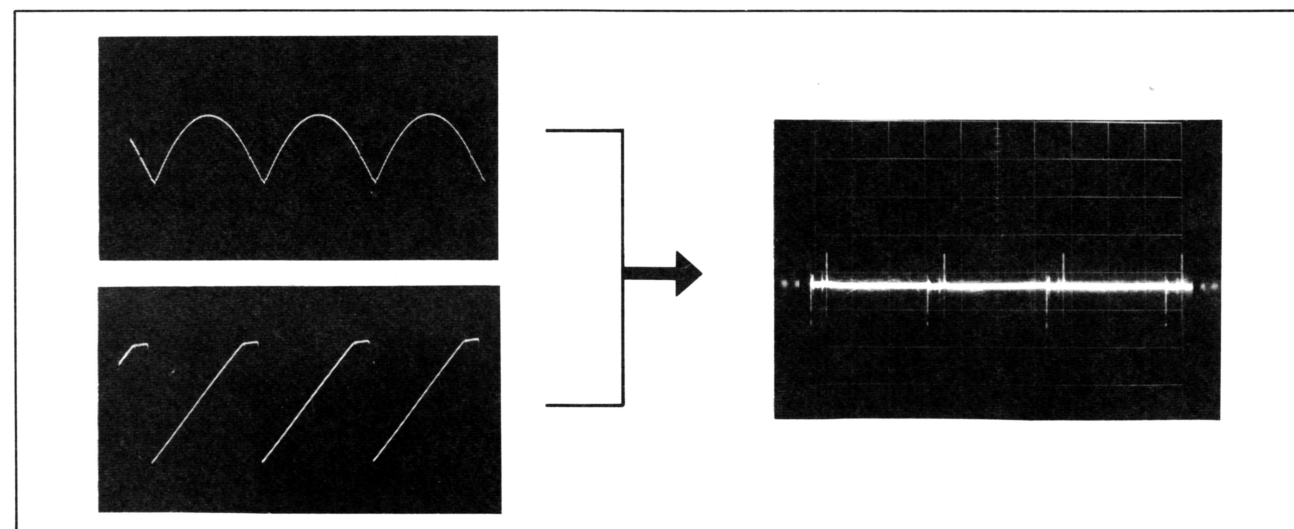


Fig. 4-3

4.3.4 Focus adjustment

1. Pick up a white sheet of paper or the blank stage of the light box. Adjust so that the white image completely fills the picture area. Set the iris control to center.
2. Connect oscilloscope to TP-6 of the VIDEO board.
3. Adjust R52 FOCUS of the DEF/HV board for maximum waveform at TP-6.

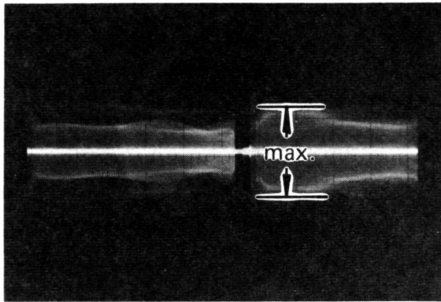


Fig. 4-6

4.3.5 V. centering

1. Set the monitor for underscan. Measure the vertical height of the raster and draw a line indicating the midpoint directly on the monitor screen (use a felt pen or other afterwards erasable marker). See Fig. 4-7.
2. Adjust so that a white image completely fills the picture area and set the lens iris for an easily seen display.
3. Use a length of lead wire to connect TP-1 to TP-2 of the DEF/HV board.
4. Turn R9 of the DEF/HV board fully clockwise so that the center mark of the pickup tube becomes visible on the monitor.
5. Adjust R17 of the DEF/HV board to align the pickup tube center mark with the previously drawn center mark on the monitor.
6. Remove the jumper wire and proceed to the following section.

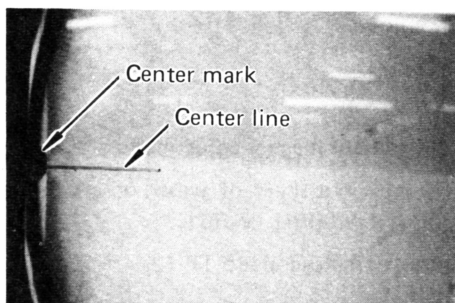


Fig. 4-7

4.3.6 H. centering

1. At completion of the previous section, the pickup tube black mask appears at the right edge of the picture (Fig. 4-8).
2. Adjust R9 of the DEF/HV board to align the black mask with the right edge of the picture (so that it is just beyond visibility).

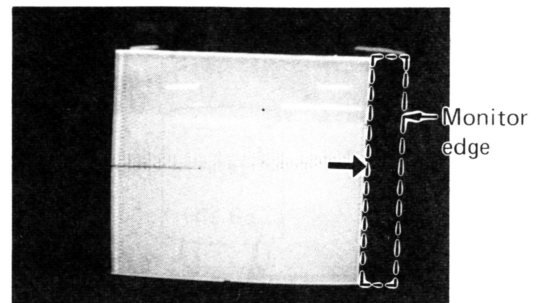


Fig. 4-8

4.3.7 V. height and Linearity

1. Adjust so that a white image completely fills the picture area and set the iris control to center.
2. Connect oscilloscope to TP-6 of the VIDEO board.
3. Adjust R46 and R24 of the DEF/HV board to minimize waveform undulations.
4. Alternately repeat this adjustment and the Focus adjustment (above section) several times.

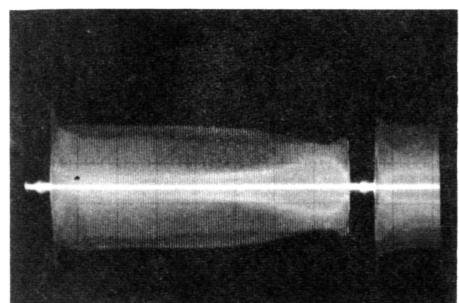
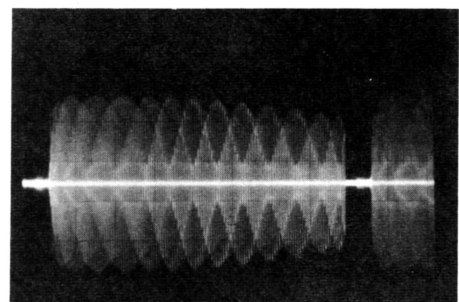


Fig. 4-9

4.3.8 H. width and Linearity

1. Adjust so that a white image completely fills the picture area and set the iris control to center.
2. Connect oscilloscope probe to TP-6 of the VIDEO board through the jig shown in Fig. 4-10.
3. Adjust R6 and R13 for maximum and flattest waveform as shown in Fig. 4-11.

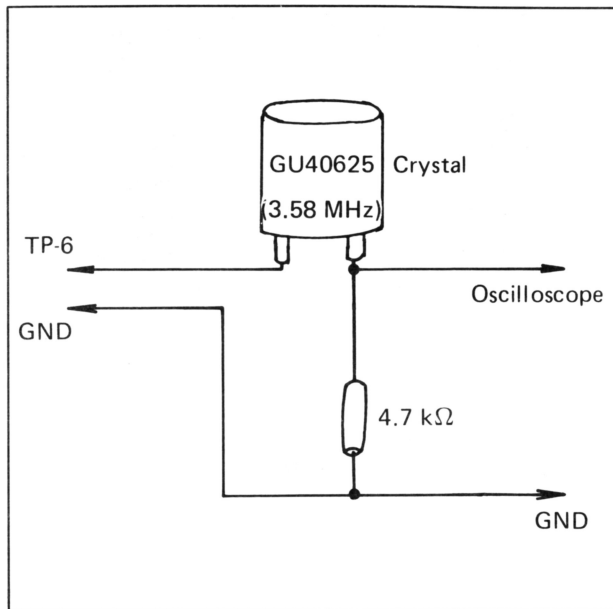


Fig. 4-10

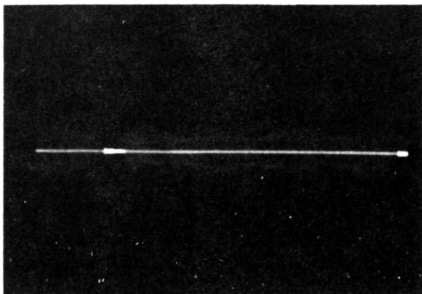
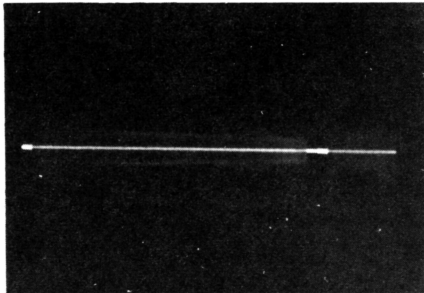


Fig. 4-11

Repeat the above steps several times to obtain the optimum adjustments.

4.3.9 Rotation adjustment

1. Loosen the pickup tube clamp screw and connect oscilloscope to TP-6.
 2. Pickup a white pattern and observe TP-6 in the H range. Grasp the pickup tube socket and turn the tube to obtain the flattest possible waveform, as shown in Fig. 4-12.
- Caution:** High voltage wiring is connected to the pickup tube socket.
3. After adjustment to the optimum point, tighten the pickup tube clamp screw.

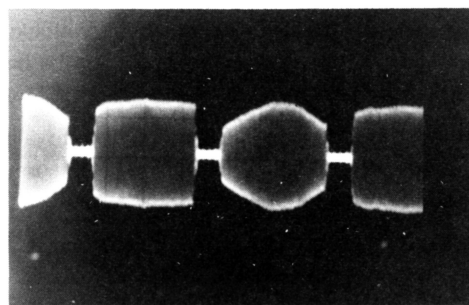
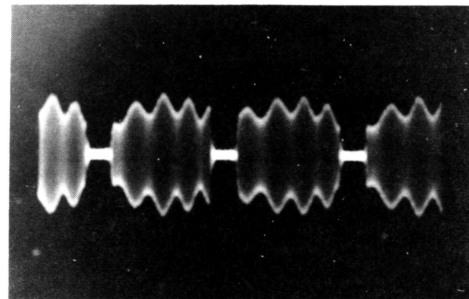


Fig. 4-12

4.3.10 Alignment magnet adjustment

1. Pick up a red sheet of paper or a white pattern through a red filter (V-R61).
2. Connect oscilloscope to TP-12.
3. Turn the alignment magnets (see Fig. 4-13) and adjust for the flattest possible H and V waveforms.

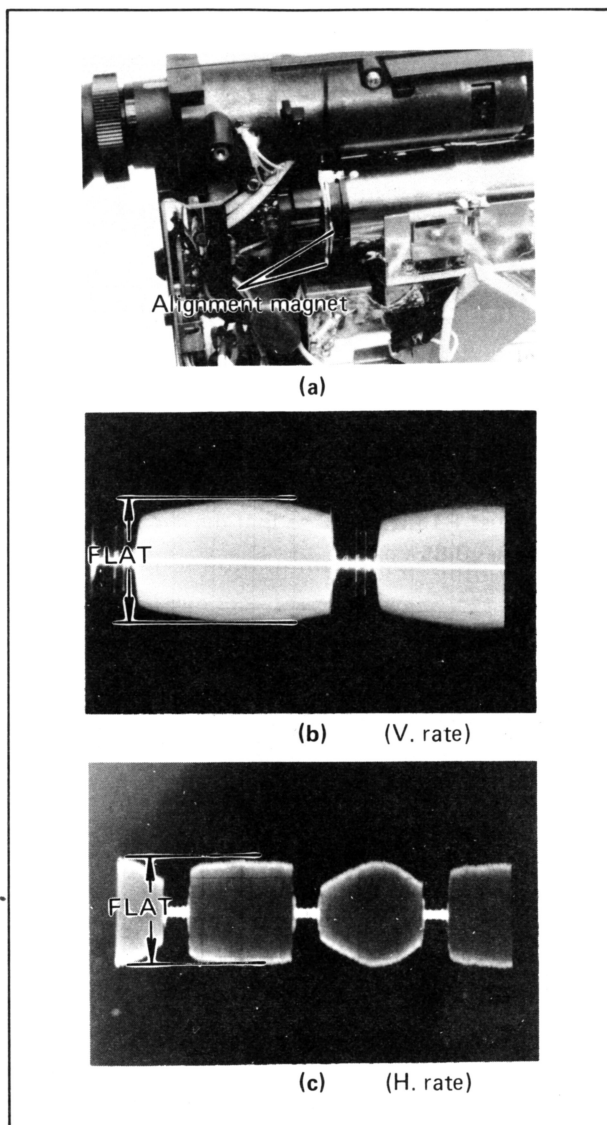


Fig. 4-13

- Notes:**
- 1) Confirm that the red color is even throughout the display on the monitor.
 - 2) The adjustments of sections 4.3.9 and 4.3.10 are required after replacing the pickup tube or deflection yoke.

4.4 SIGNAL SYSTEM ADJUSTMENTS

4.4.1 Pedestal

1. Cap the lens and connect oscilloscope to TP-2 of the VIDEO board.
2. Adjust R21 (P. SET) to center the waveform as shown in Fig. 4-14.

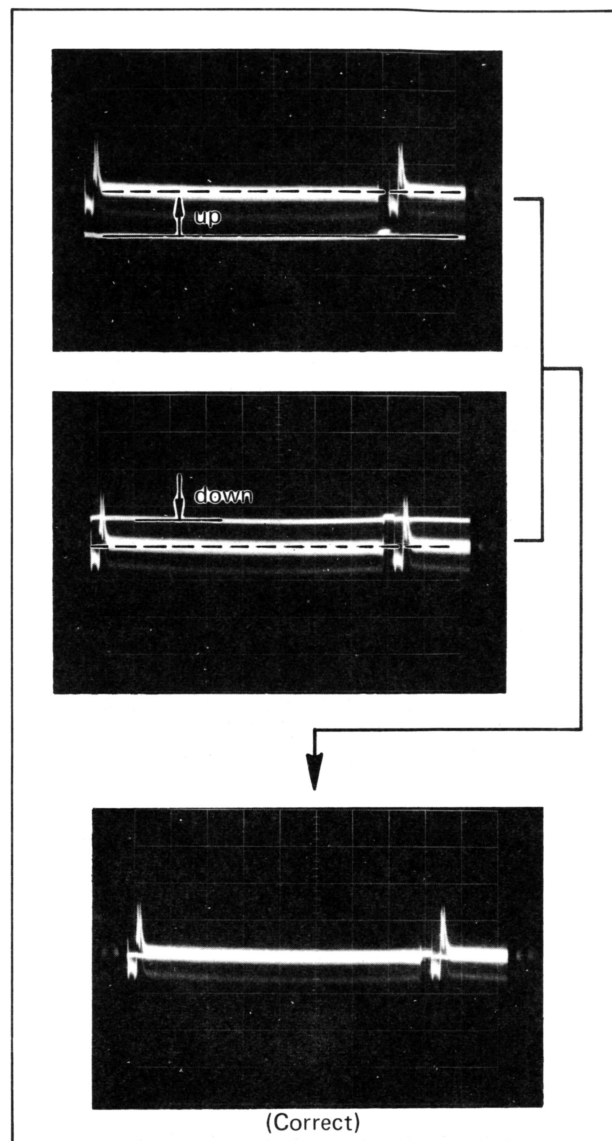


Fig. 4-14

4.4.2 Y setup

1. Cap the lens and connect oscilloscope to TP-3.
2. Adjust R16 Y SETUP for a 70 mV pedestal level.

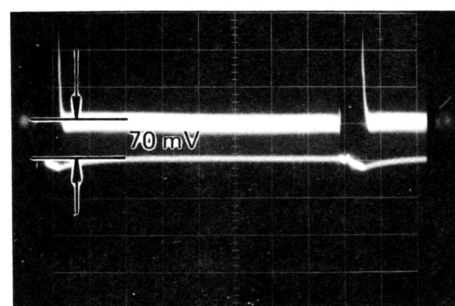


Fig. 4-15

4.4.3 Y lowband setup

1. Connect oscilloscope to IC6 pin 14. Turn R23 Y. L. SETUP fully counter-clockwise to the off position and read the value at this time (AmV in Fig. 4-16).
2. Adjust R23 to obtain A + 10 mV.

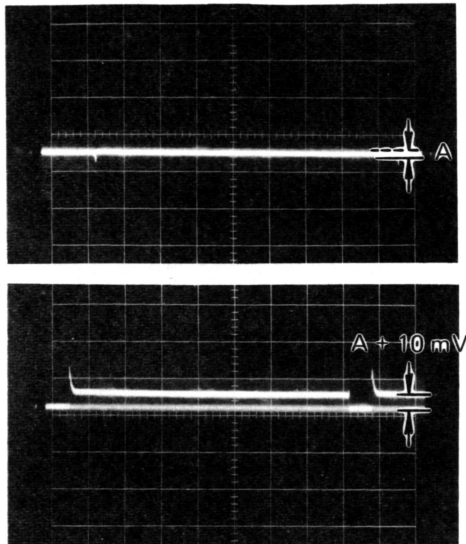


Fig. 4-16

4.4.4 Y gamma set

1. Set W. CLIP and COLOR LEVEL controls to minimum.
2. Pick up greyscale and adjust the lens iris to obtain a level of 1.2 Vp-p at TP-2.
3. Connect oscilloscope to TP-3 and adjust R26 Y. L. γ SET so that the stairstep waveforms become straight lines.

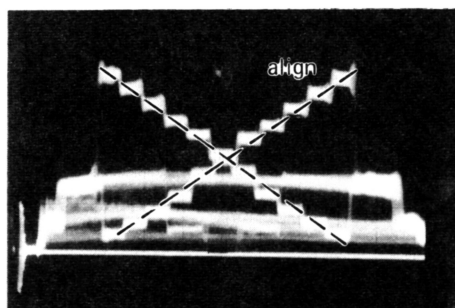


Fig. 4-17

4.4.5 Y gain

1. Pick up greyscale and adjust the lens iris to obtain a level of 1.2 Vp-p at TP-2.
2. Set R72 (C GAIN) for the VIDEO board to minimum.
3. Connect oscilloscope to TP-3 and adjust R17 Y. GAIN for a 0.7 Vp-p white level.

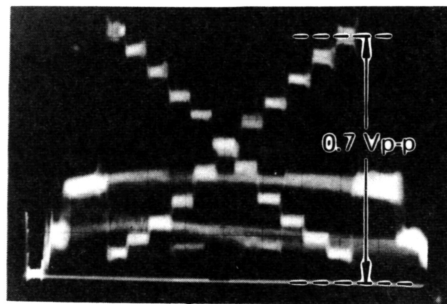


Fig. 4-18

4.4.6 White clip

1. In the same condition as above, fully open the lens iris.
2. Adjust R15 W. CLIP so that the clipping point becomes 0.85 Vp-p.

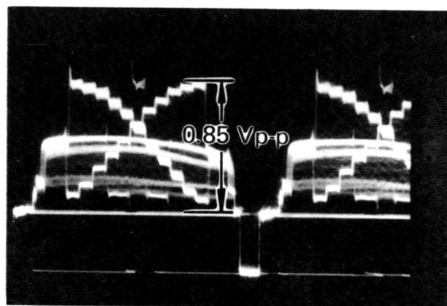


Fig. 4-19

4.4.7 Blue separation

1. Pick up a red sheet of paper or use a red colored filter (V-R61) and pick up a white pattern. Set the lens iris to center and adjust so that the pattern completely fills the picture area.
2. Connect oscilloscope to TP-7 of the VIDEO board. Alternately adjust R46 B. BAL and C12 B. PHASE several times to obtain the minimum waveform.

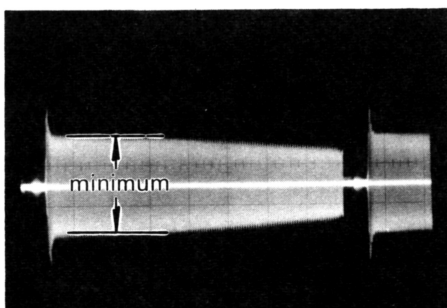


Fig. 4-20

4.4.8 Red separation

1. Similarly, pick up a blue sheet of paper or use a blue colored filter (V-42) and pick up a white

pattern. Adjust so that the pattern completely fills the picture area.

2. Connect oscilloscope to TP-12 of the VIDEO board. Alternately adjust R80 R. BAL and C13 R. PHASE several times to obtain the minimum waveform.

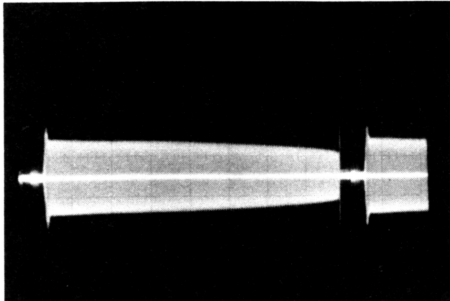


Fig. 4-21

4.4.9 Red and Blue setup and gain

1. Cap the lens and connect oscilloscope to TP-14 (R-Y).
2. Adjust R91 R. SETUP to center the waveform.
3. Similarly, connect the oscilloscope to TP-10 (B-Y) and adjust R60 to center the waveform.
4. Remove the lens cap and connect the oscilloscope to TP-2.

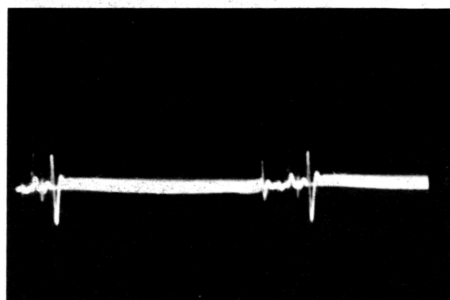
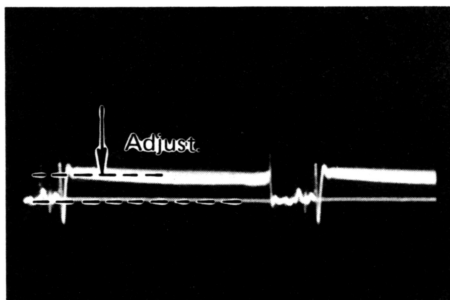


Fig. 4-22

5. Pick up a white pattern and adjust the lens iris for a 0.5 Vp-p waveform.
6. Adjust R81 R. GAIN and R47 B. GAIN to center the waveforms of TP-14 (R-Y) and TP-10 (B-Y) as shown in Fig. 4-23.

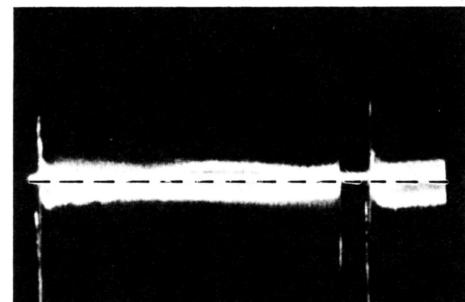
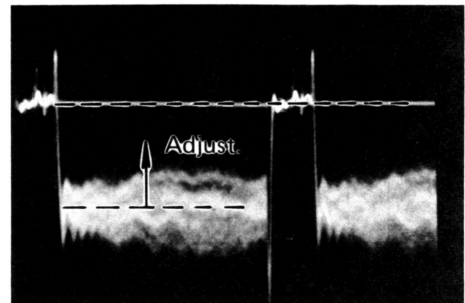


Fig. 4-23

4.4.11 Shading adjustment

1. Pick up a white pattern and adjust the lens iris for 0.5 Vp-p at TP-3.
2. Connect oscilloscope to TP-14 (R-Y). To obtain the flattest possible waveform in both the H rate and V rate, adjust R38 (R. H. SAW), R36 (R. H. PARA), R42 (R. V. SAW), and R93 (R. V. PARA).
3. Similarly, connect oscilloscope to TP-10 (B-Y). To obtain the flattest possible waveform, adjust R82 (B. H. SAW), R80 (B. H. PARA), R44 (B. V. SAW) and R91 (B. V. PARA).
4. Observe the display on a monitor and confirm absence of local colorations.

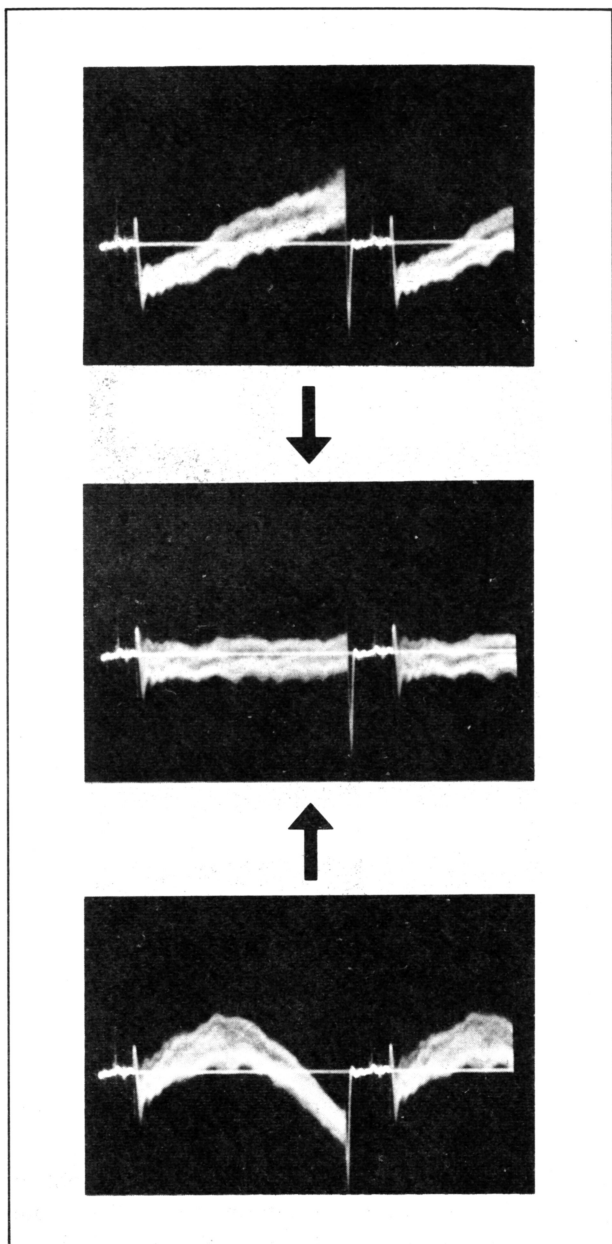


Fig. 4-24

4.4.12 Degamma adjustment

1. Turn R86 (R. γ . set) and R55 (B. γ . set) of the VIDEO board fully counterclockwise.
2. Pick up the greyscale pattern and adjust the lens iris for 0.8 Vp-p at TP-2.
3. Connect a dual-trace oscilloscope to TP-13 (R) and TP-9 (YL) and set oscilloscope for the ALT mode.
4. Use the vertical position and sensitivity controls of the oscilloscope to overlap the two waveforms as shown in Fig. 4-25.
5. Adjust R30 (DE- γ) to overlap the portions of the waveforms below 50%. Note that TP-13 waveform is higher at above 50%.

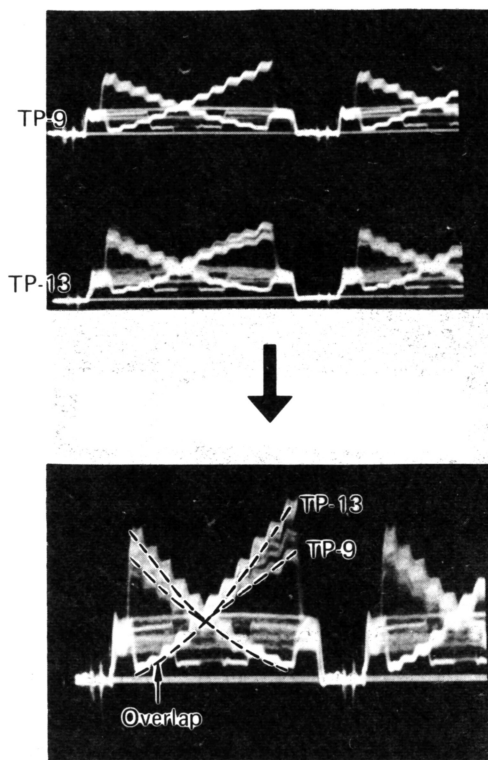


Fig. 4-25

4.4.13 White balance

1. Pick up the greyscale pattern and adjust so that the pattern image completely fills the picture area. Set the lens iris for 0.75 Vp-p video level at TP-3.
2. For minimum carrier leak at the first step of the greyscale, adjust R91 (R-SETUP) and R60 (B-SETUP).
3. Adjust R81 (G-GAIN) and R47 (B-GAIN) for minimum carrier leak at the center.
4. Repeat the above adjustments (items 2 and 3) several times for minimum carrier leak at levels above 50%.

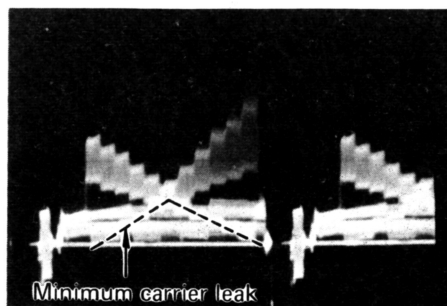


Fig. 4-26

- Adjust R86 (R- γ -SET) and R55 (B- γ -SET) for minimum carrier lead at the 50% level (set to the point just before carrier leak increases below the 50% level).
- Adjust R89 (R- γ) and R58 (B- γ) to minimize carrier leak above the 50% level.
- Repeat the above items several times.

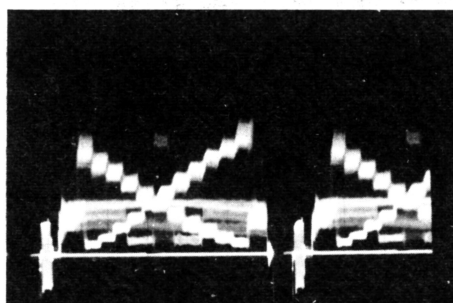
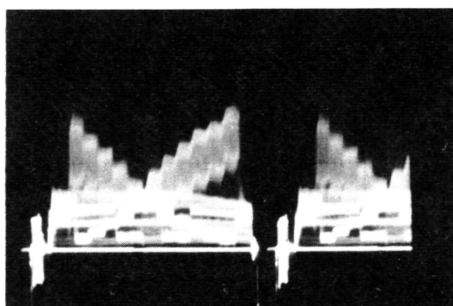


Fig. 4-27

4.4.14 Chroma limiter

- Pick up the greyscale and adjust the lens iris for more than 0.85 Vp-p at TP-3 (above the clipping level).
- Observe the display on a color monitor and adjust R32 (C. LIMIT) so that green coloration in the white portions that exceed the clipping level becomes minimized.

4.4.15 Burst level

- Connect oscilloscope to TP-3.
- Gradually turn R73 of the VIDEO board clockwise and adjust for a burst level in the output signal of 0.3 Vp-p.

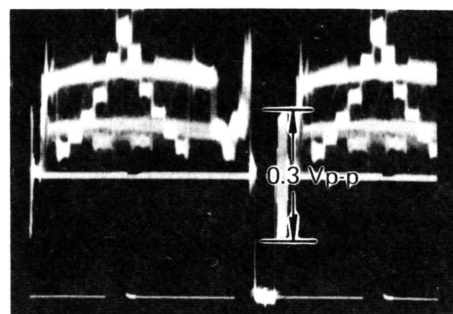


Fig. 4-28

4.4.16 Auto iris

- Set the auto iris switch to on.
- Pick up the greyscale pattern and adjust so that the image completely fills the picture area. Illuminate the greyscale at more than 700 lux.
- Connect oscilloscope to TP-3 of the VIDEO board and adjust R74 of the DEF/HV board for a white peak of 0.7 Vp-p.

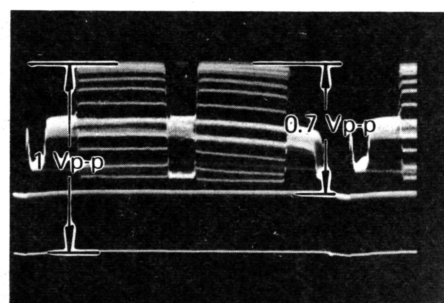


Fig. 4-29

4.4.17 Alarm set

- Use a variable power supply as power source and measure the power supply voltage with a voltmeter.
- Gradually reduce the power supply voltage. Adjust R64 of the DEF/HV board so that the alarm flickers when the power supply voltage declines to 10.9 V.

4.4.18 Iris LED

- Pick up the greyscale. Set the auto iris switch to on.
- Adjust R75 to just beyond the point where both red and green indicators in the viewfinder extinguish.
- Set the iris for manual. Open the iris manually and confirm indicator lighting in the sequence red → extinguish → green.

4.4.19 Color compensator gain

1. Connect oscilloscope to IC3 pin 1 of the COLOR COMP board.
2. Pick up the greyscale.
3. Adjust R6 for minimum error signal.
4. Operate the iris and confirm absence of large variations in the waveform.

4.4.20 Color balance

1. Pick up the greyscale pattern and observe the display on a color monitor.
2. Adjust R8 for absence of coloration (magenta or green) in the portions of the pattern indicated in Fig. 4-31.
3. Operate the lens iris and confirm absence of coloration.

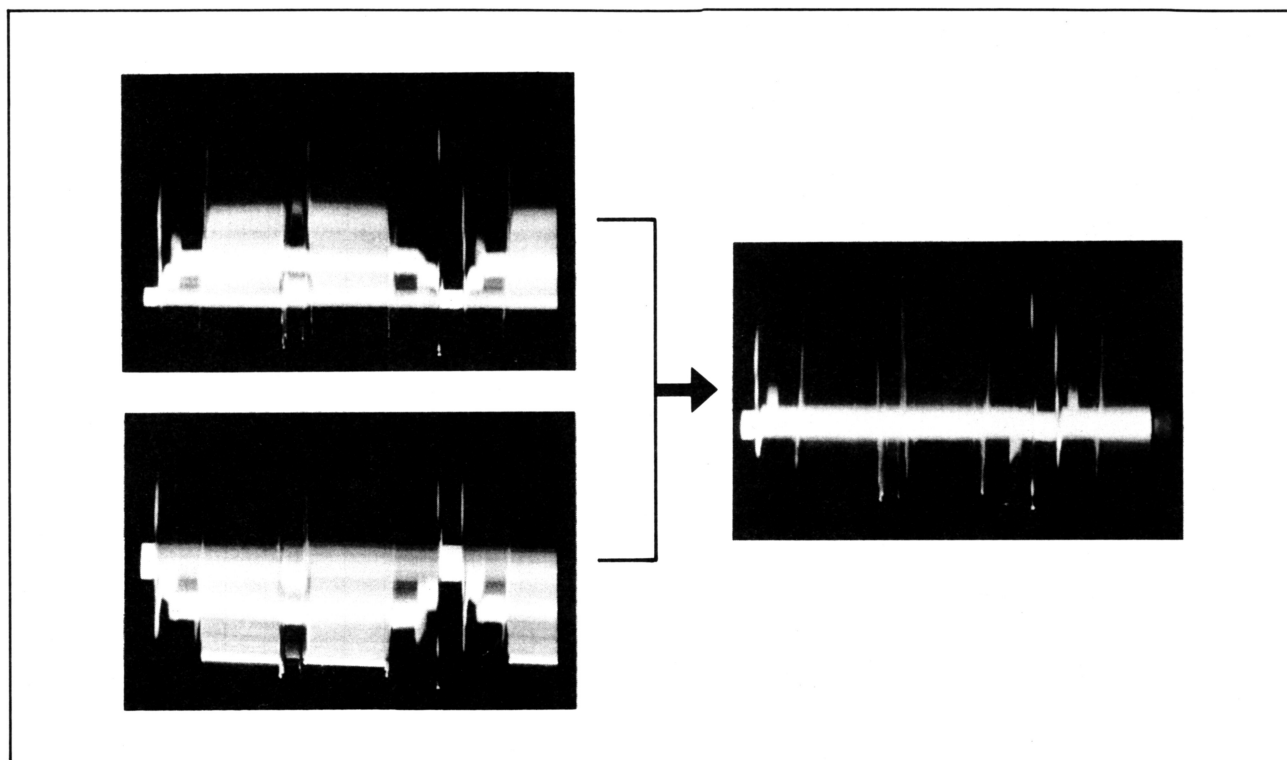


Fig. 4-30

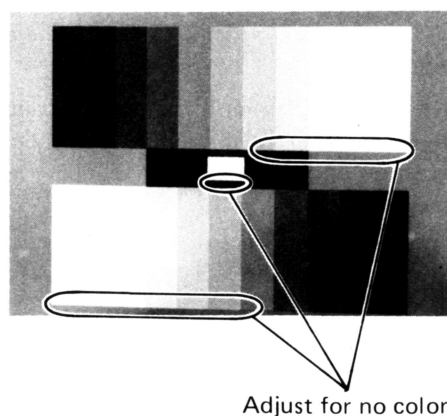
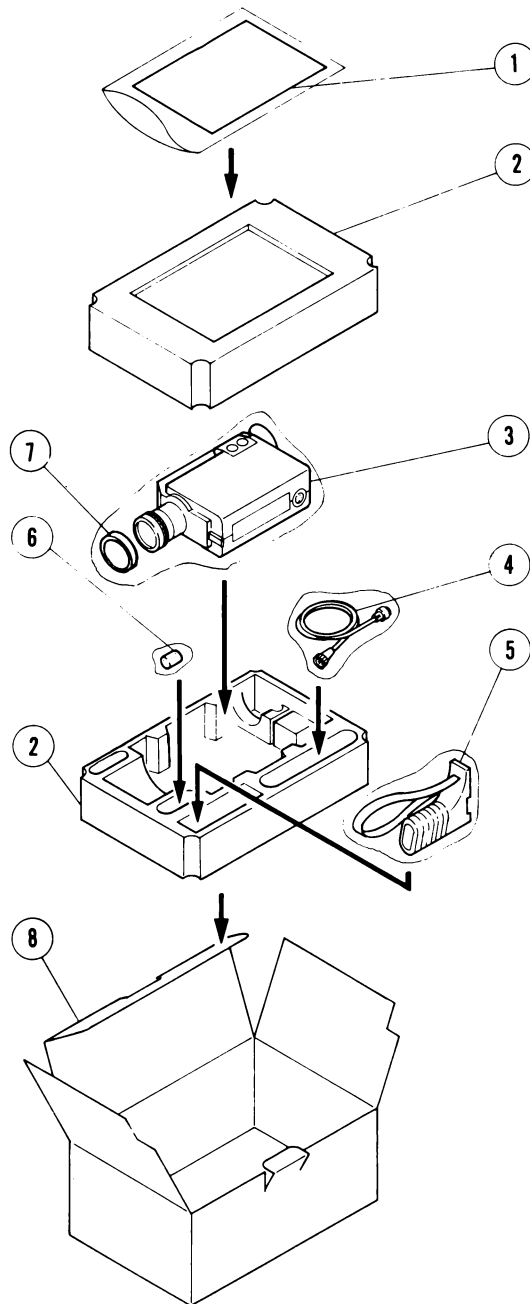


Fig. 4-31

SECTION 5 REPACKING



Ref. No.	Part No.	Part Name	Description	Q'ty
1	PU30425-281	Instruction Book		1
2	PUP30433A	Cushion Ass'y		1
3	GX-33E/66E	—		—
4	PU32161D	Camera Cable Ass'y	(3.0 m)	1
5	PU32146A	Grip Ass'y		1
6	PU47624B	Wind Screen		1
7	PU47621B	Lens Cap Ass'y		1
8	PUP30434- **	Packing Case	** GX-33EG : -7 GX-33EK : -5	1

SECTION 6
EXPLODED VIEWS AND PARTS LIST

IMPORTANT SAFETY NOTICE

Parts identified by the  symbol are critical for safety. Replace with parts number specified. For maximum reliability and performance, all other replacement parts should be identical to those specified.

- 6.1 CABINET ASSEMBLY
- 6.2 OPTIAL ASSMBLY
- 6.3 GRIP ASSEMBLY

In these exploded views the part numbers of the screws and washers refer to shape. The following examples illustrate the coding system.

Examples:

SPSP3006ZS
"ISO" metric screw thread
Length in mm (6mm)
Diameter in mm (3mm)
Cross-recrossed, pan head screw

LPSP3014ZS
Length: 14mm
Diameter: 3mm
Cross-recrossed, pan head screw with lock washer

DPSP4008ZS
Diameter: 4 mm
Cross-recrossed, pan head screw with lock washer and plain washer

SSSP3008ZS
Cross-recrossed, flat countersunk head screw

SDBP3006NS
Cross recrossed, binding head screw

YRS3004FS
Hexagon socket set screw with sunken tip

YFS3006FS
Hexagon socket screw with flat tip

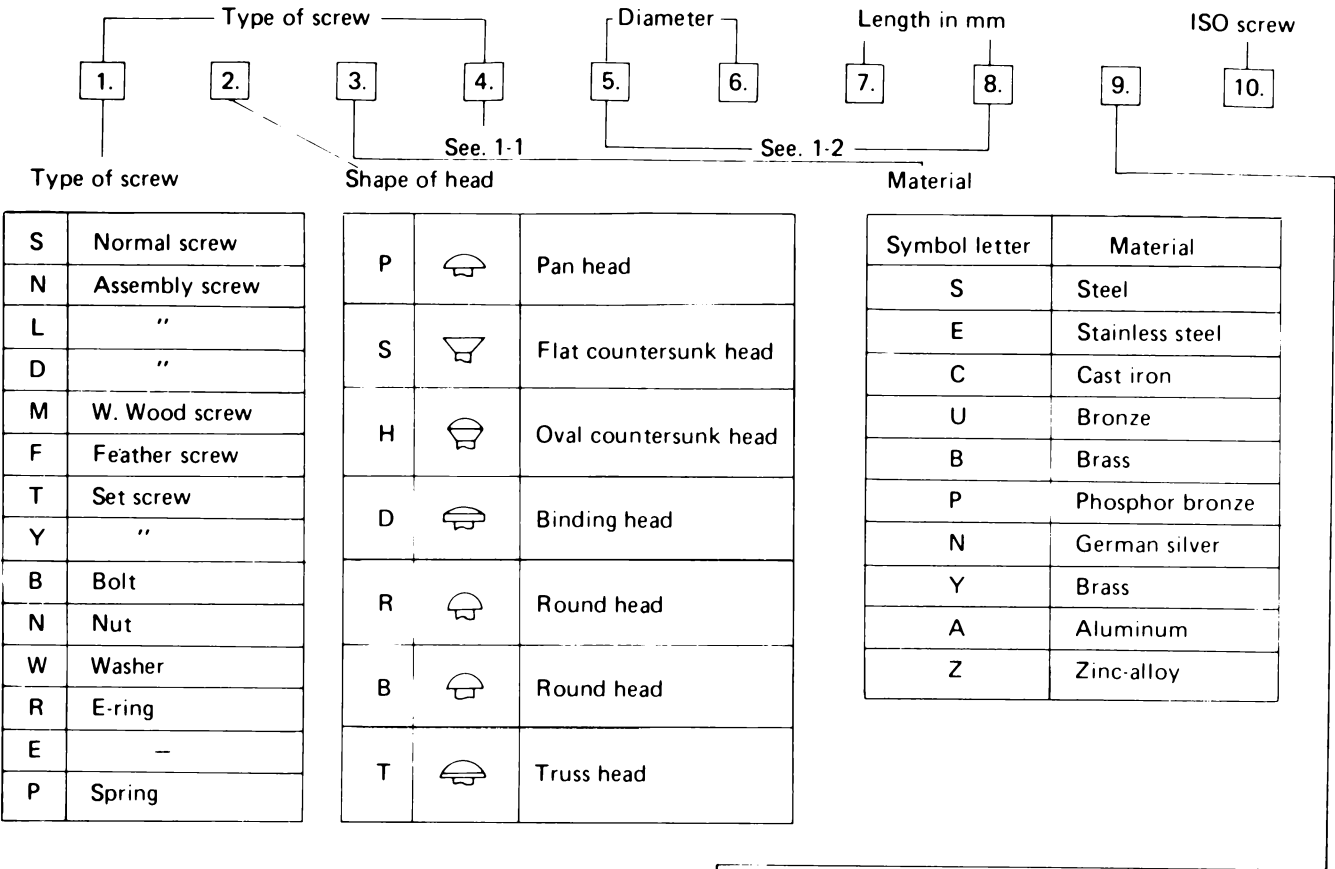
BYS3006FS
Hexagon socket head bolt

WLS3000
Diameter of the applicable screw (3 mm screw)
Lock washer

WNS3000Z
Plain metal washer

REE4000
Diameter of the stud slot.
Retaining ring ("E" type)

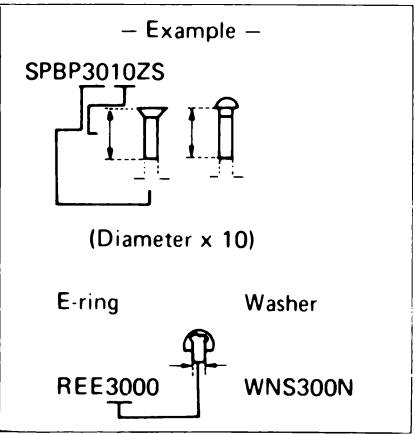
SCREW/WASHER/E-RING



1-1 Type of screw

P	Cross-Recessed head screw
A	Tapping screw
B	Tapping screw

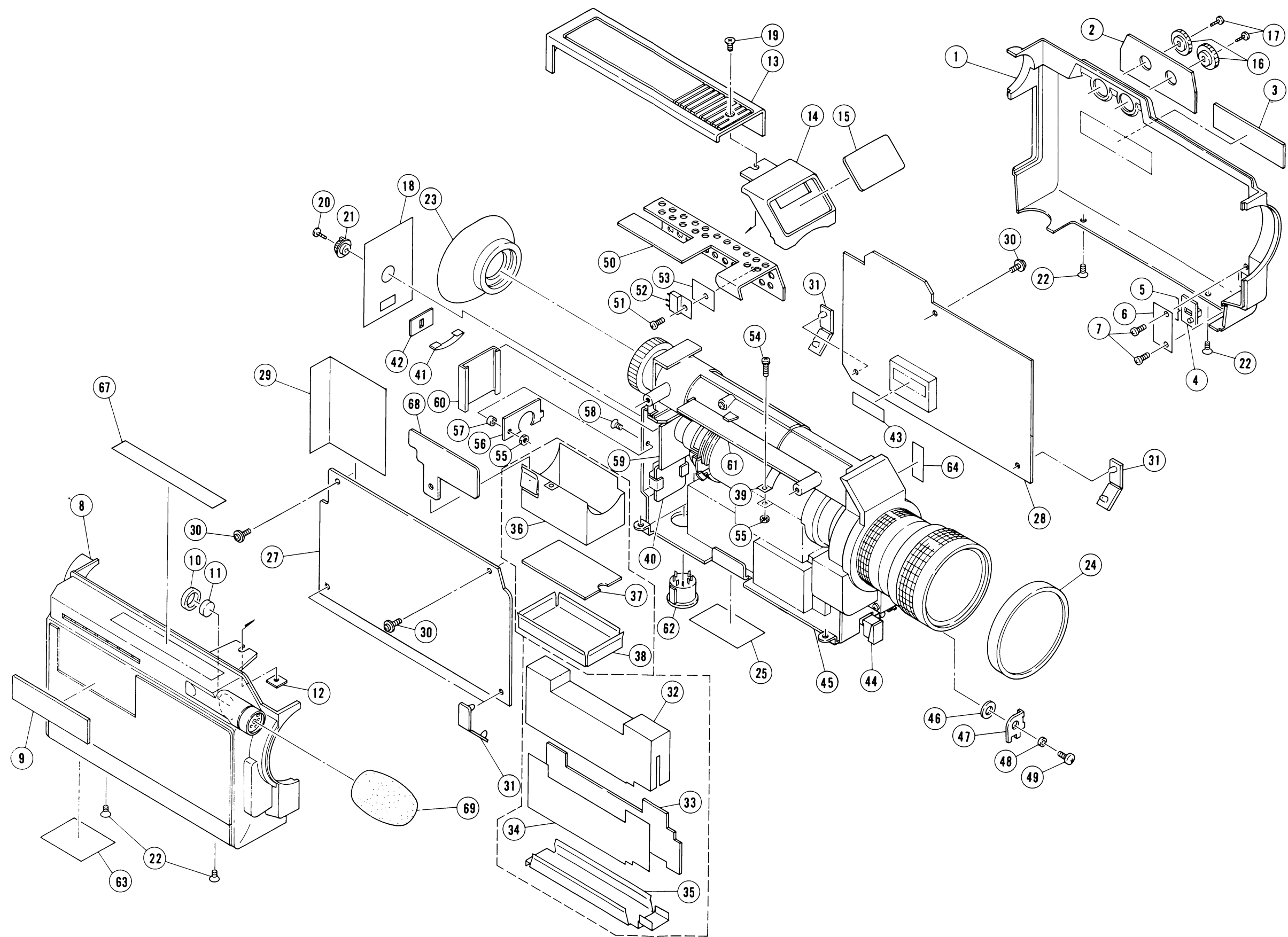
1-2 Diameter and Length of screw



Surface treatment

Symbol letter	Surface treatment
Z	Galvanization, dichromic acid treatment (MFZn2-C)
N	Nickel plating (MFNi2, MFNiI)
R	Chrome plating (MBCr2, MBCr1)
G	Silver plating (SP4)
W	Nichrome platings
P	Phosphite treatment
B	Bronze plating
M	Black coloring after galvanization
F	Iron with black coloring

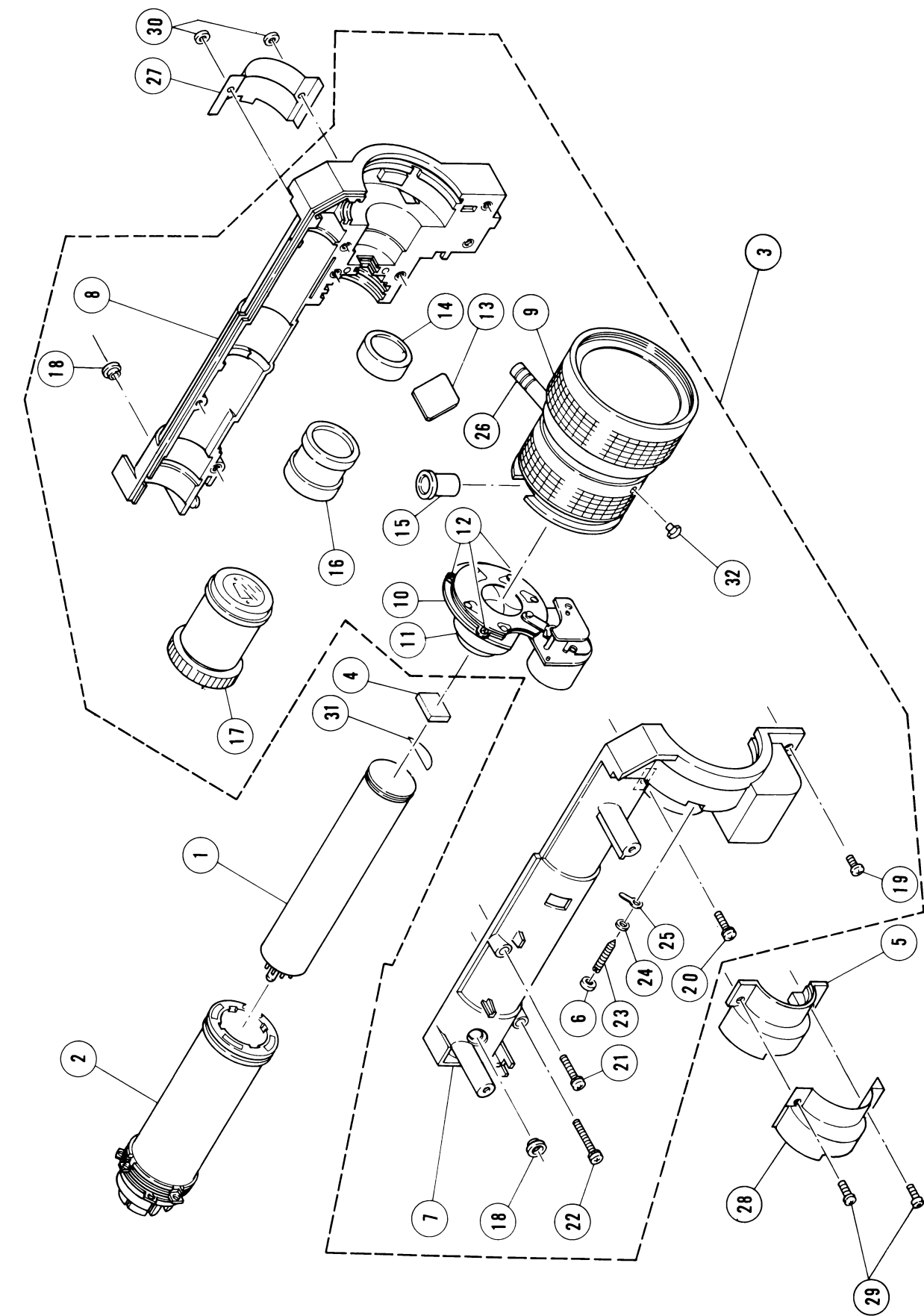
6.1 CABINET ASSEMBLY



Symbol No.	Part No.	Part Name	Description	Q'ty
1	PU32144C	R. Cabinet Ass'y	Incl: ②③	1
2	PU47645-2	Plate		1
3	PU48049	Side Mark		1
4	PU47626	Lock Knob		1
5	PU47671	Lock Spring		1
6	PU47627	Plate	Incl: ⑨	1
7	SBSB2003Z	Screw		2
8	PU32145C	L. Cabinet Ass'y		1
9	PU48049	Side Mark		1
10	PU47629	Bushing		1
11	PU46946	Mic	Incl: ⑮	1
12	PU47611	Tapping Plate		1
13	PU32132	Top Cover		1
14	PU48073C	Head Cover Ass'y		1
15	PU48048	Mark		1
16	PU47633	Knob		2
17	PU47634	Special Screw		2
18	PU48297	Back Plate		1
19	SSBP2606N	Screw		1
20	PU47634-2	Special Screw		1
21	PU48211	Knob		1
22	SSBP2605M	Screw		4
23	PU48491	Eye Cap		1
24	PU47621C	Lens Cap Ass'y		1
25	PU47643-9	Ser. No. Plate		1
26	—	—	REF: ⑧② REF: ⑧③	1
27	PU47573E	Video Process P.W.B. Ass'y		—
28	PU47574E	DEF & H.V. P.W.B. Ass'y		—
29	PU48018-2	Shield Plate		1
30	SWSP2606Z	Screw		3
31	PU47613	Hinge	REF: ⑧④	4
32	PU47684	Shield Case		1
33	PU47575E	S.S.G. P.W.B. Ass'y		—
34	PU48084	Shield Plate		1
35	PU47685	Shield Cover		1
36	PU47608A	Shield Case ass'y	REF: ⑧⑦ REF: ⑧⑧	1
37	PU47577A	PRE Amp P.W.B. Ass'y		—
38	PU47609	Shield Cover		1
39	PU47610-1-2	Band		1
40	PU47579A	Switch P.W.B. Ass'y		—
41	PU47614-2	Spring	Incl: ④⑥ — ④⑨	1
42	PU47636-2	Sheet		1
43	PU42091	No. Plate		2
44	PU47632	Start Knob		1
45	PU32188B	Bracket Ass'y		1
46	WSB5000N	Washer		1
47	PU47668	Lever		1
48	T30302-8	Collar		1
49	SDSP3006Z	Screw		1
50	PU48051-1-3	Heat Sink		1
51	SPKP3004S	Screw	for X001	1
52	2SB566C	Transistor		1
53	PU45375	Milar Base		1
54	SPBP2610Z	Screw		1
55	NNB2600	Nut		2

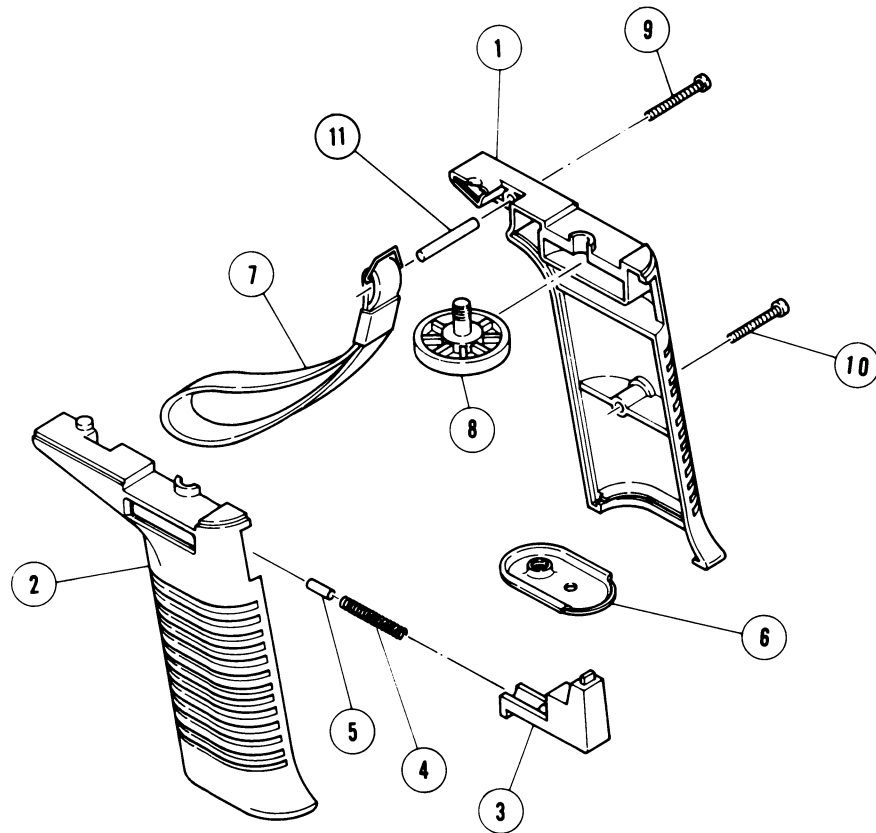
Symbol No.	Part No.	Part Name	Description	Q'ty
56	PU48246A	VR P.W.B. Ass'y	REF: ⑧⑩	—
57	T30302-8	Collar		1
58	SWSP2606Z	Screw		1
59	PU47578A	Vidicon Socket P.W.B. Ass'y	REF: ⑧⑨	—
60	PU48085-1-1	Insulator		1
61	PU48502B	Color Comp. P.W.B. Ass'y	REF: ⑧⑥	—
62	PU48240	Socket		1
63	PU47385	Sticker		1
64	PU47030	Label		1
65	—	—		1
66	—	—		1
67	PU46146	Caution Label		1
68	PU48552A	Mic Amp P.W.B. Ass'y		1
69	PU47624B	Wind Screen		1

6.2 OPTIAL ASSMBLY



Symbol No.	Part No.	Part Name	Description	Q'ty
△ 1	S4094P	Vidicon		1
	PU47592	DEF. Yoke Ass'y		1
	PU20867C	Optical Block Ass'y		1
	PU47607	Optical L.P.F.		1
	PU32136-1-2	Vidicon Cover		1
6	PU48059	Nut	3 Optical Block Ass'y	1
7	PU10216-1-4	Lens Frame (R)		1
8	PU10217-1-4	Lens Frame (L)		1
9	PU47581-2	Zoom Lens		1
10	PU47583	Servo Eye		1
11	PU47584	Master Lens	3 Optical Block Ass'y	1
12	SSSP2004	Screw		3
13	PU47586	Mirror		1
14	PU47587	Field Lens		1
15	PU47585	V.F. Master Lens		1
16	PU47588-1-2	Relay Lens	3 Optical Block Ass'y	1
17	PU47589-1-1	Eye Piece		1
18	PU47590-1-4	LED Holder		2
19	LPSP2608	Screw		1
20	LPSP2608	Screw		1
21	LPSP2614	Screw	3 Optical Block Ass'y	1
22	LPSP2614	Screw		1
23	TRS2616Z	Screw		1
24	WLS2600N	Lock Washer		1
25	ML-PU1049	Wire		1
26	PU47582	Zoom Rod	3 Optical Block Ass'y	1
27	PU32207	Shield Case (B)		1
28	PU32206	Shield Case (A)		1
29	SPBP2610Z	Screw		2
30	PU48059	Nut		2
31	PU47605-1-2	Masking Sheet		1
32	PU47998	Cap		1

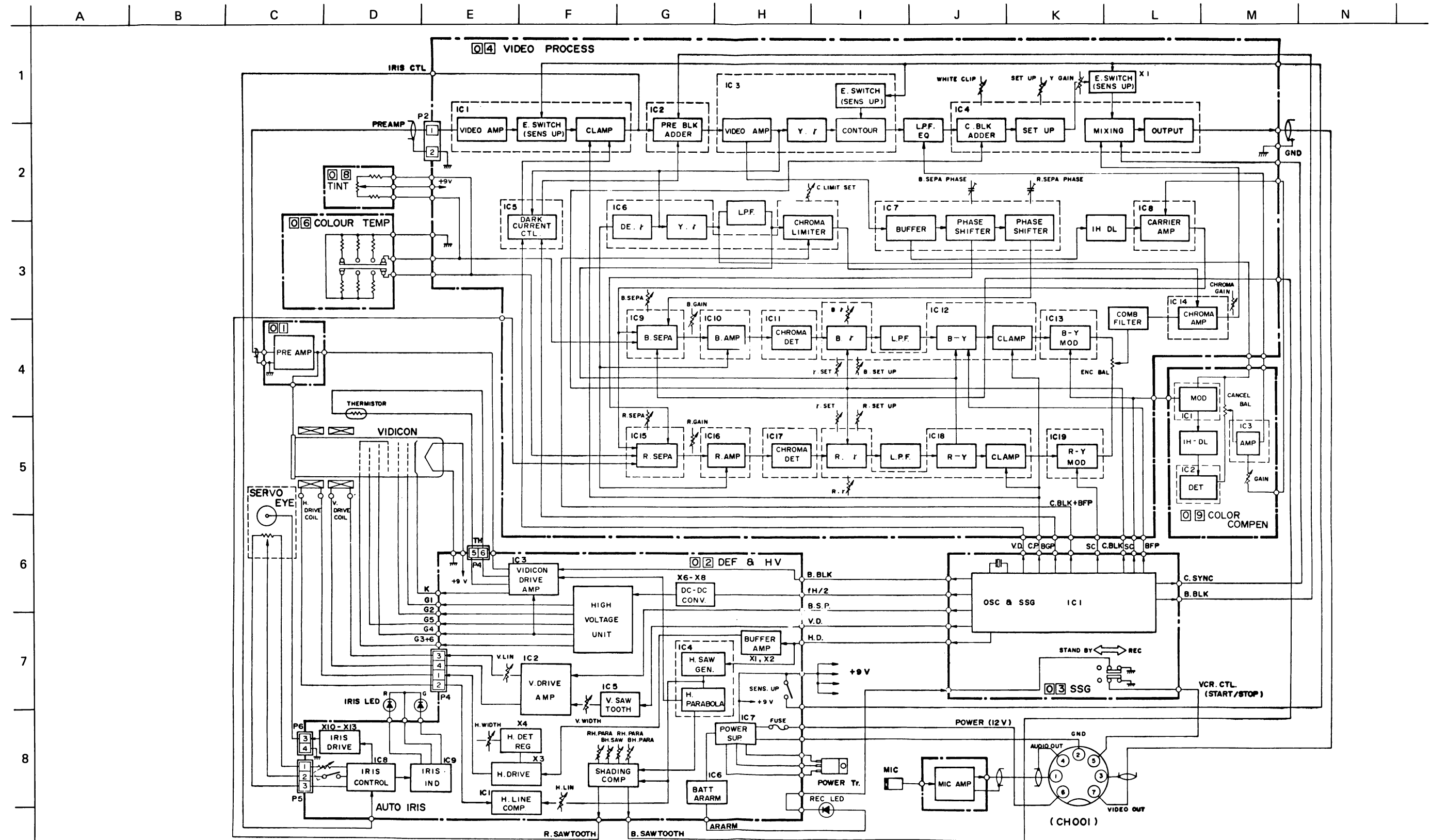
6.3 GRIP ASSEMBLY

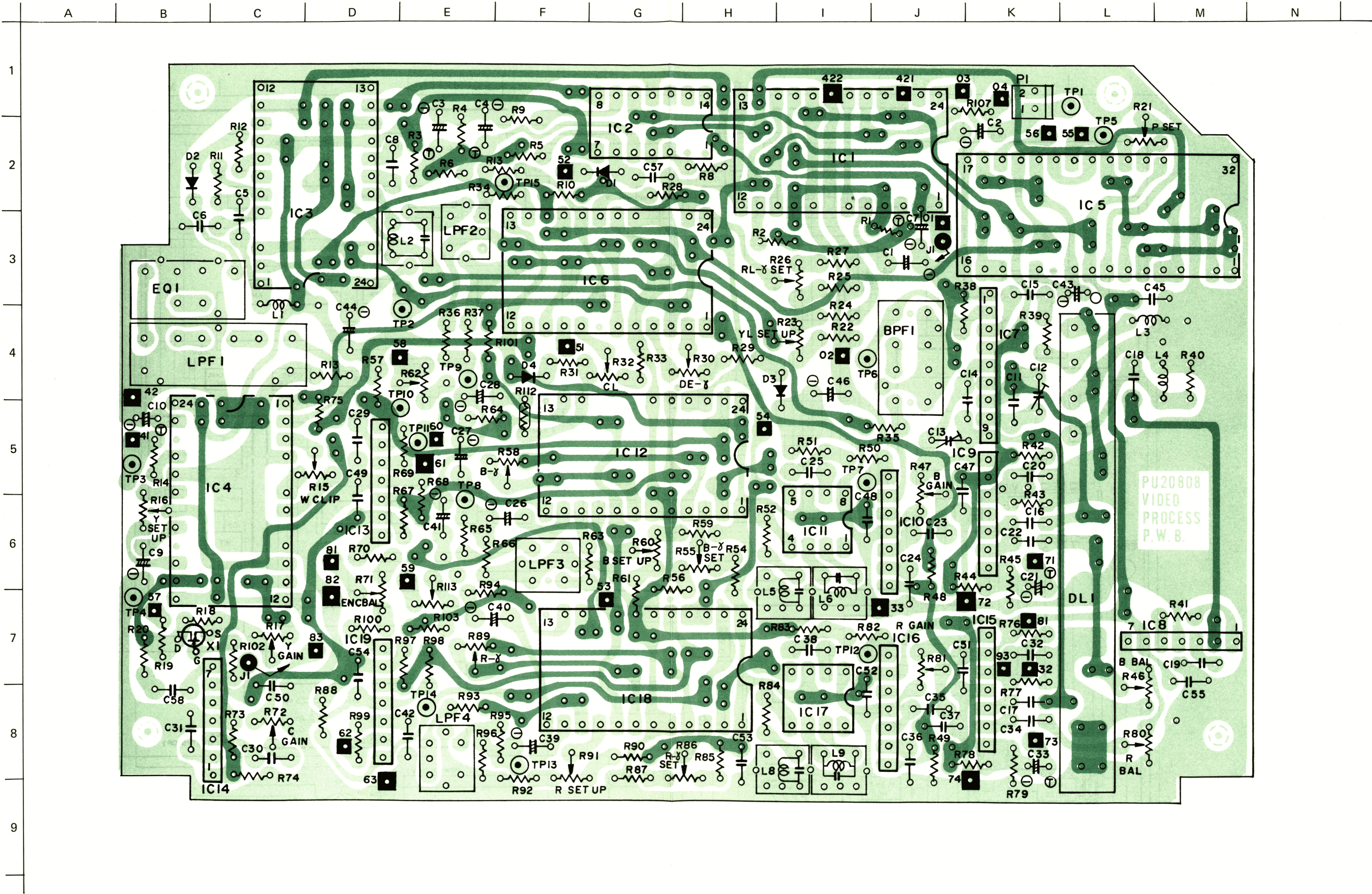


Ref. No.	Part No.	Part Name	Description
1	PU32146A	Grip Ass'y	Include ① – ⑪
2	PU32134	Grip (A)	
3	PU32135	Grip (B)	
4	PU47615	Start Knob	
5	PU47616	Spring	
6	PU47999	Pin	
7	PU47644	Tapping Plate	
8	PU47619	Strap Ass'y	
9	PU47617	Screw	
10	SPBP3024MS	"	
11	SPBP3020MS	"	
11	PU47618	Tube	

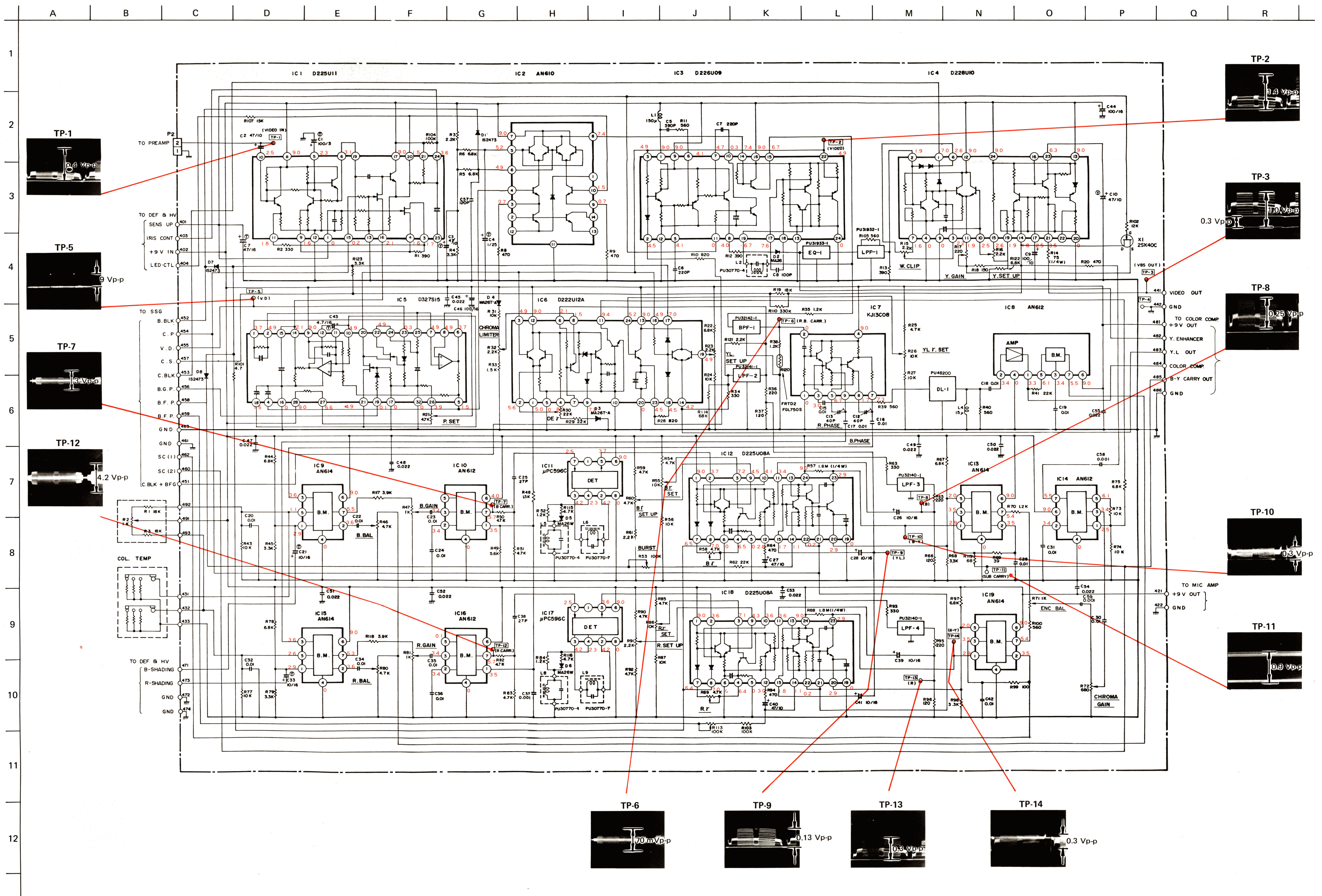
SECTION 7 DIAGRAMS AND CIRCUIT BOARDS

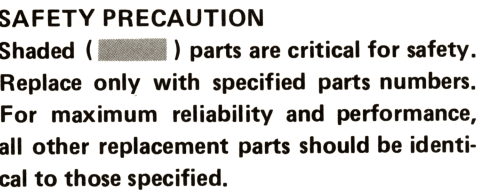
7.1 BLOCK DIAGRAM



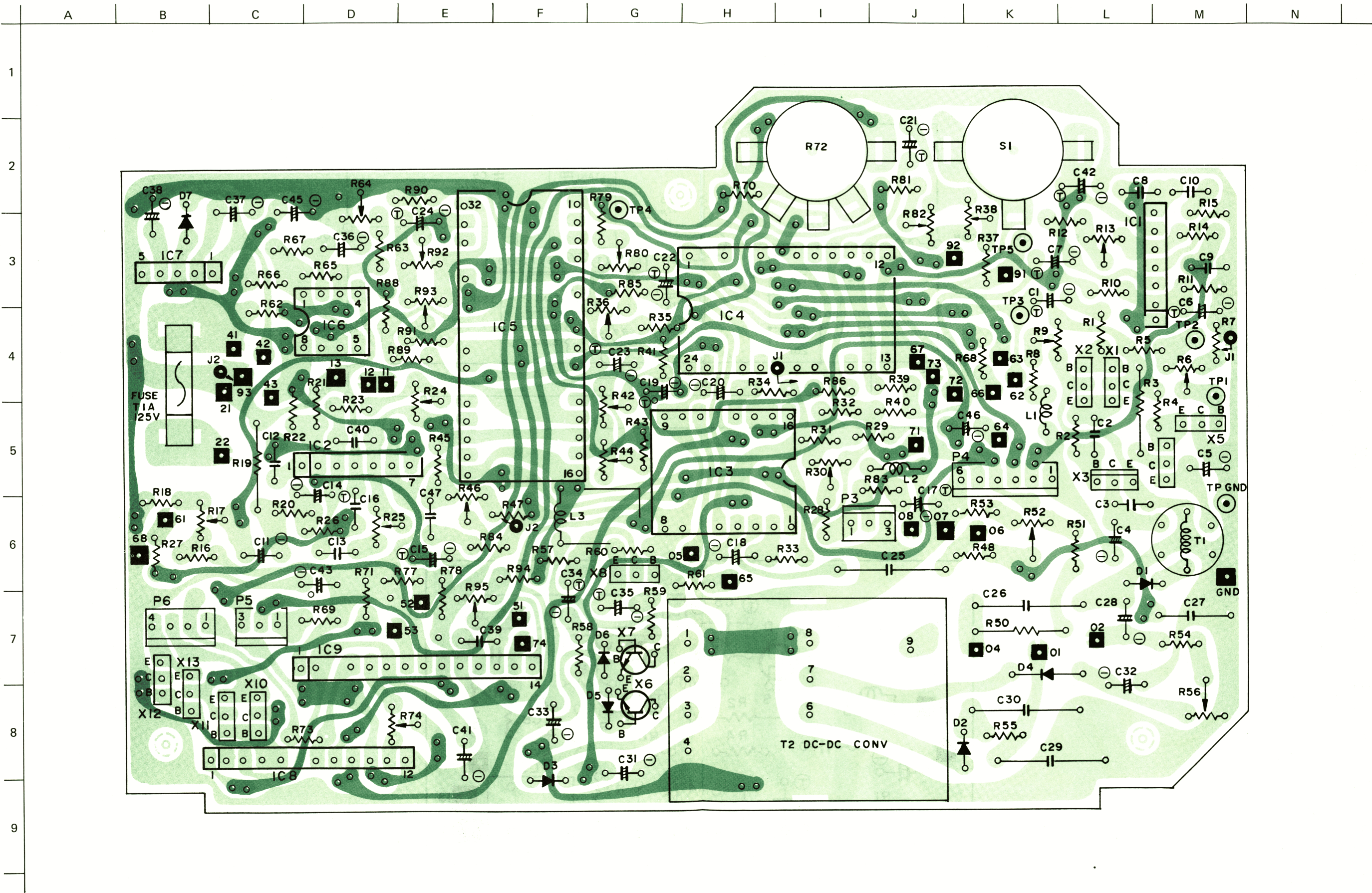


7.3 VIDEO PROCESS SCHEMATIC DIAGRAM

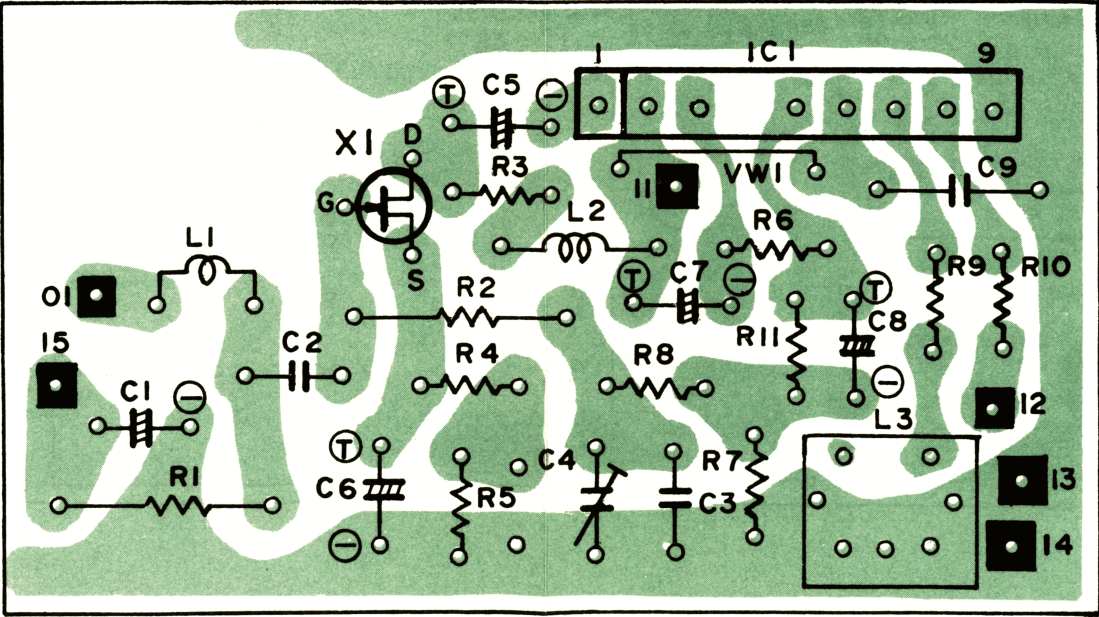
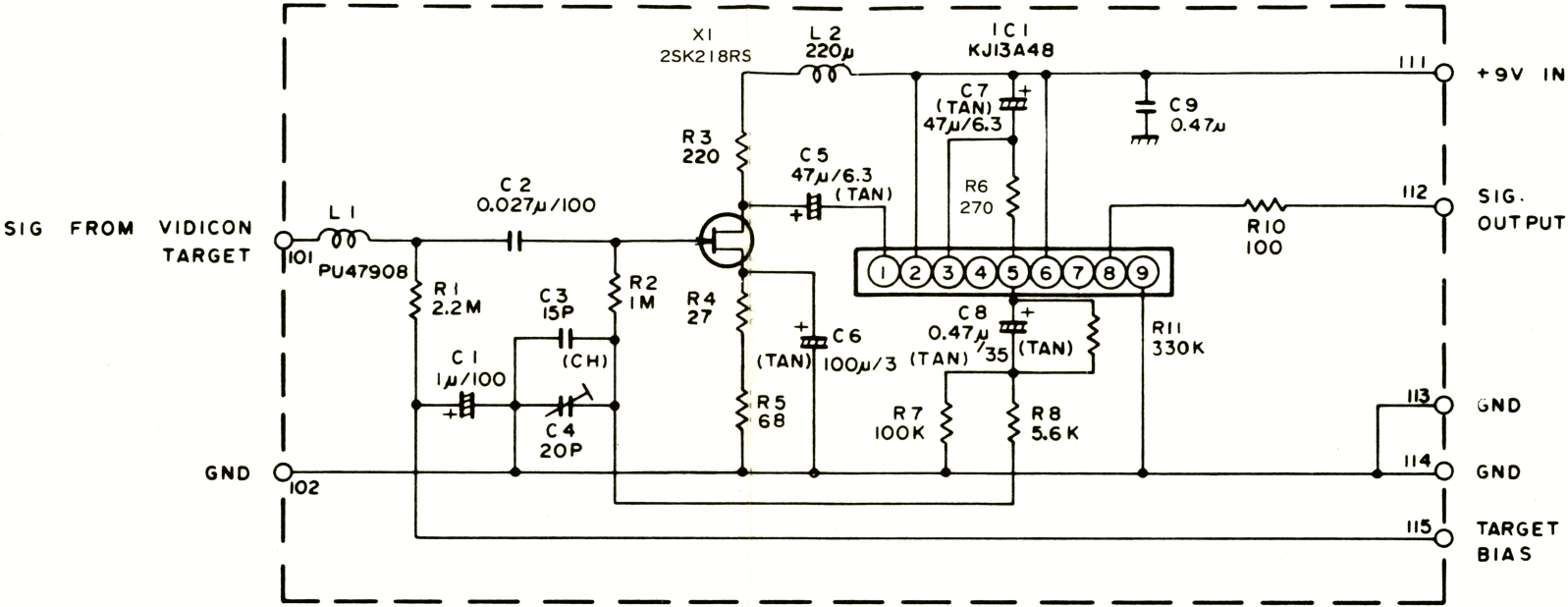




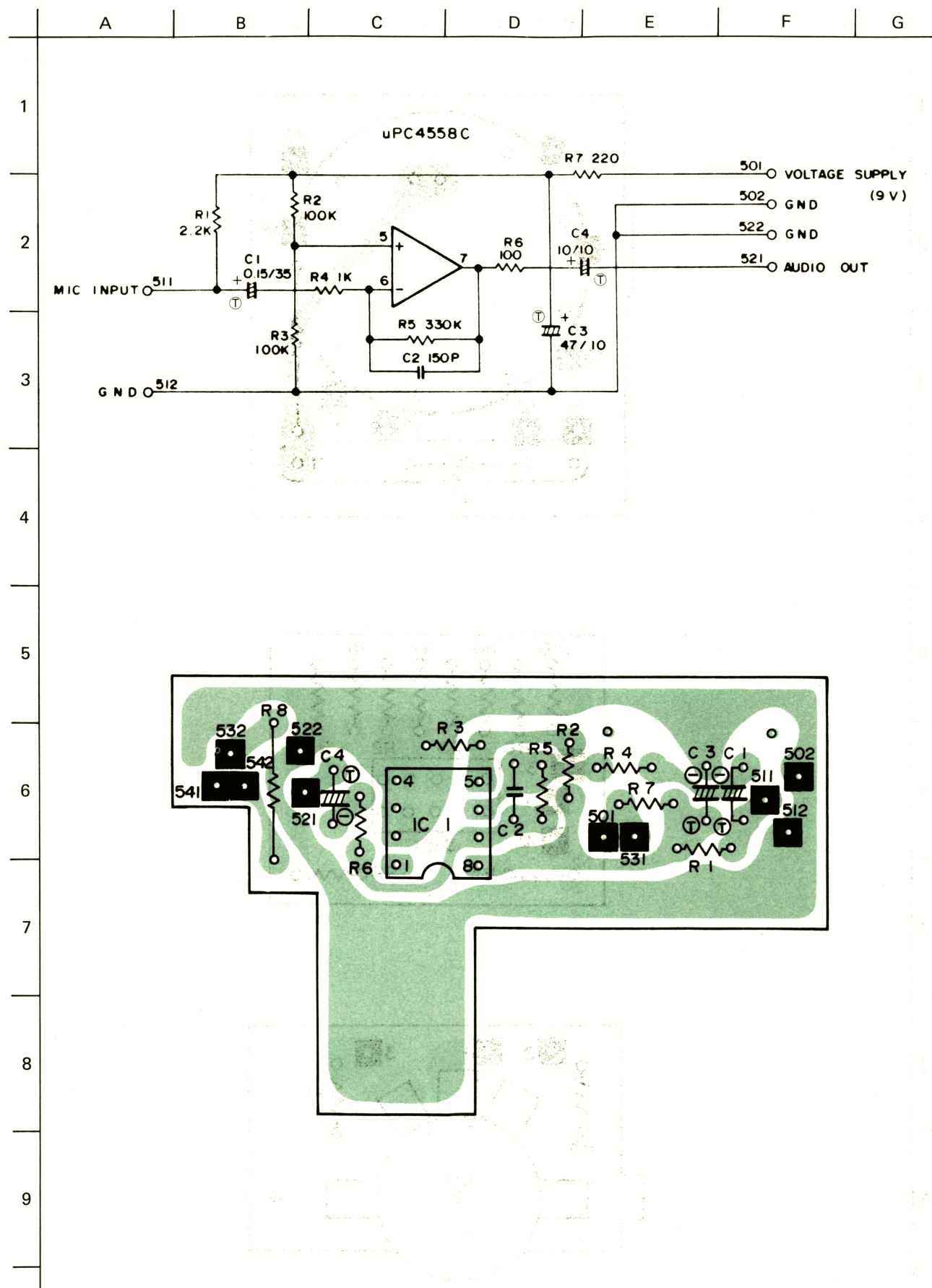
7.5 DEFLECTION AND HIGH VOLTAGE CIRCUIT BOARD



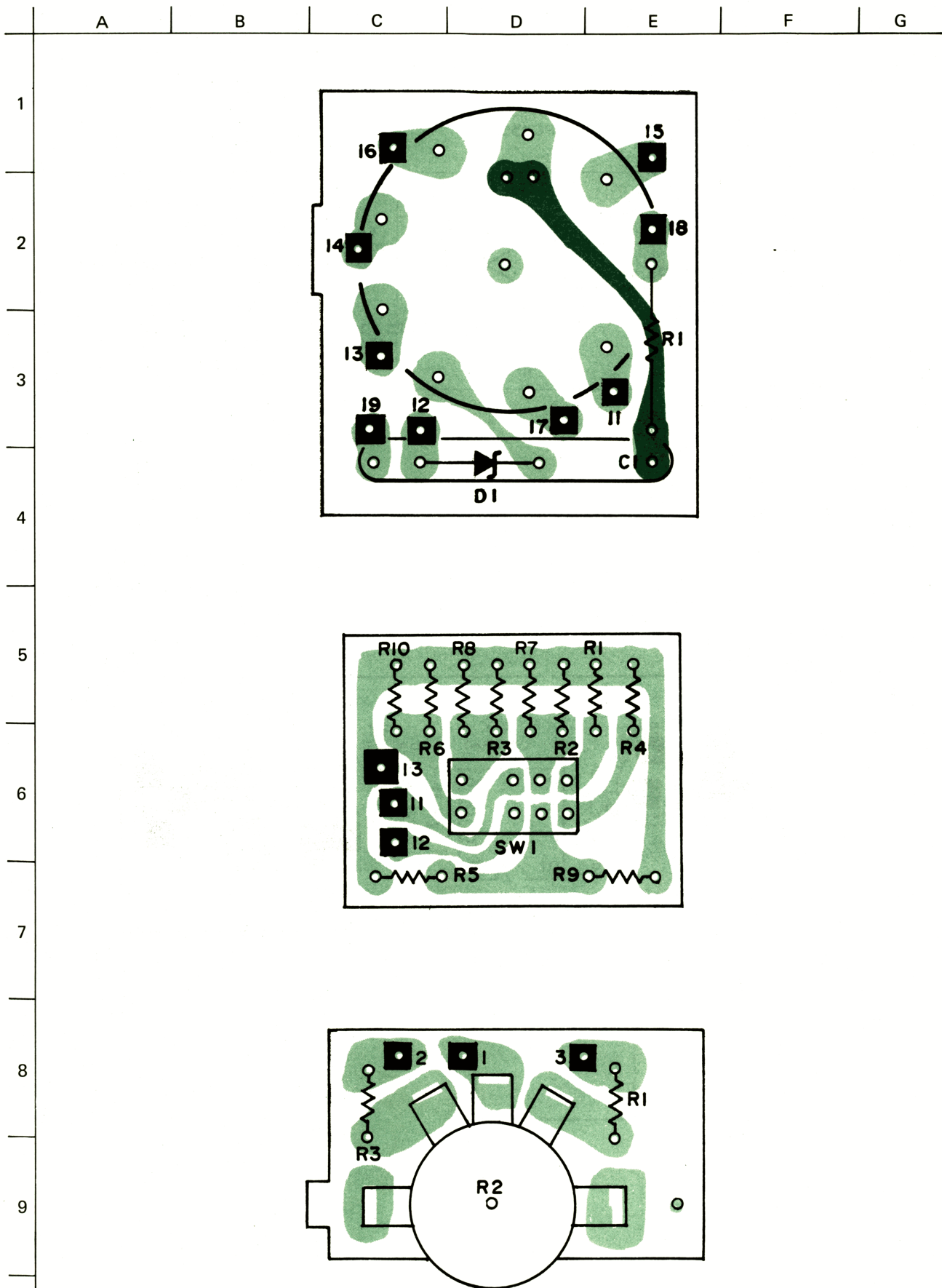
7.6 PRE AMP SCHEMATIC DIAGRAM AND CIRCUIT BOARD



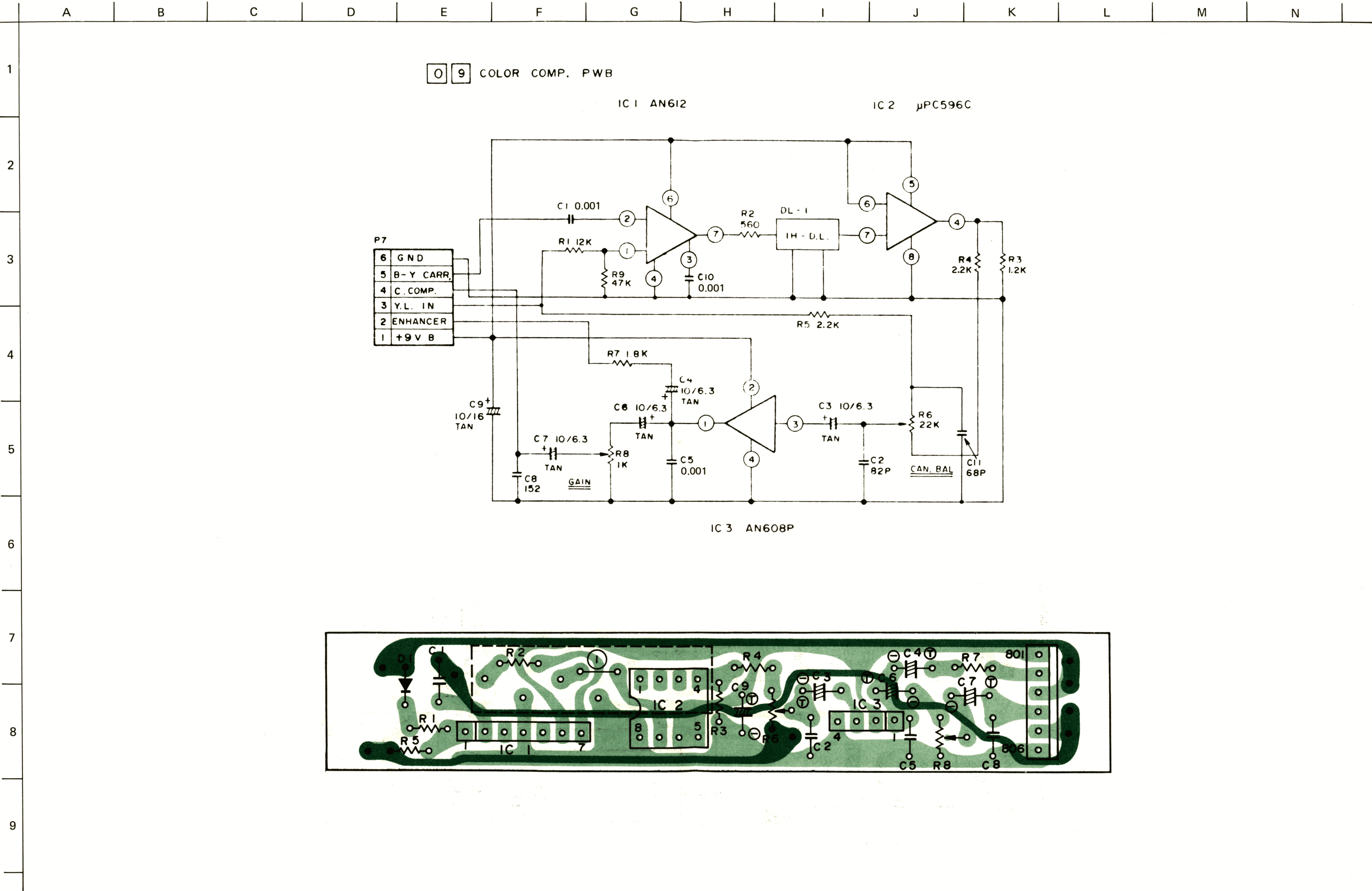
7.7 MIC AMP SCHEMATIC DIAGRAM AND CIRCUIT BOARD



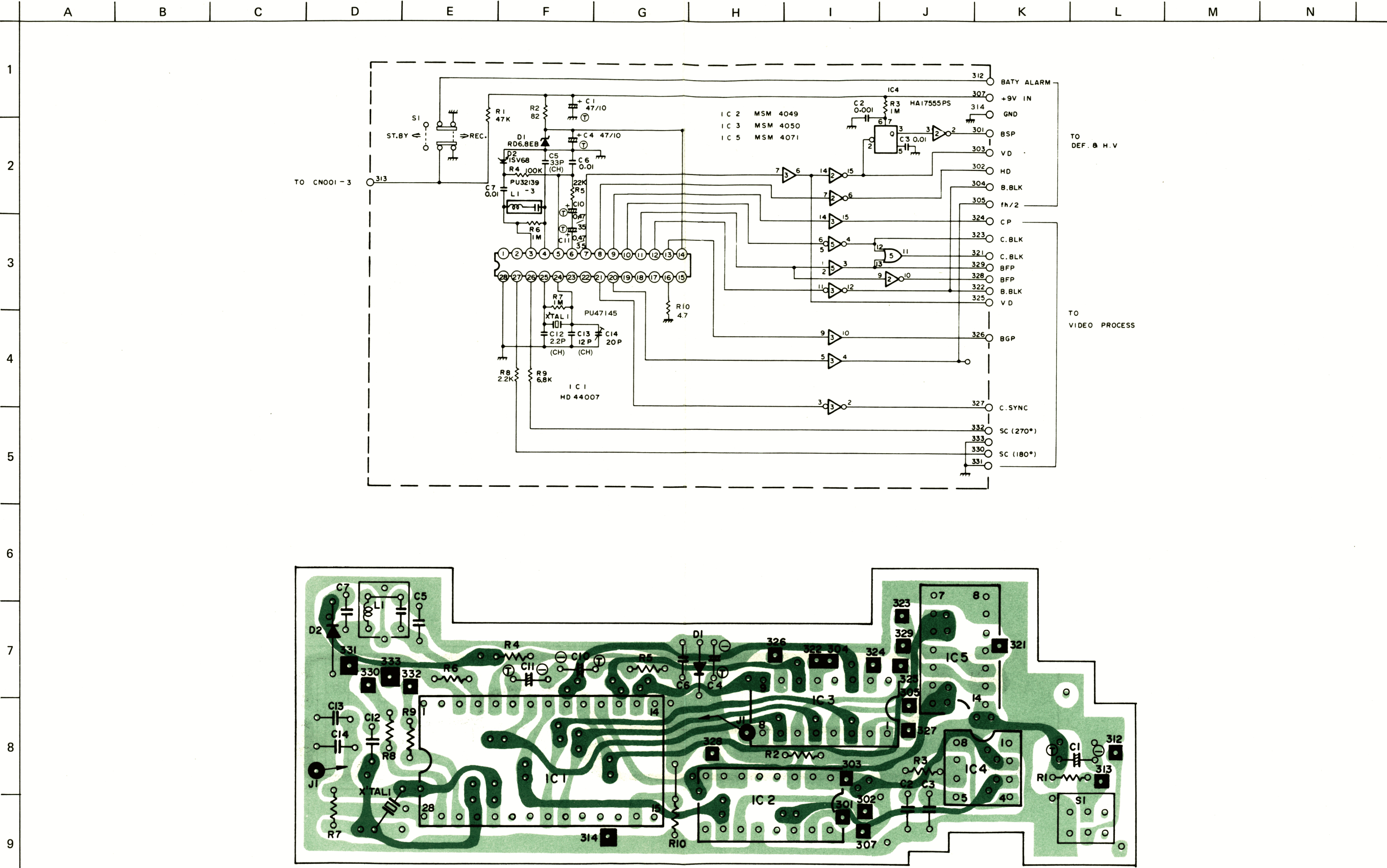
7.8 CONNECTOR BOARD SWITCH BOARD VR. BOARD



7.9 COLOR COMPENSATOR SCHEMATIC DIAGRAM AND CIRCUIT BOARD

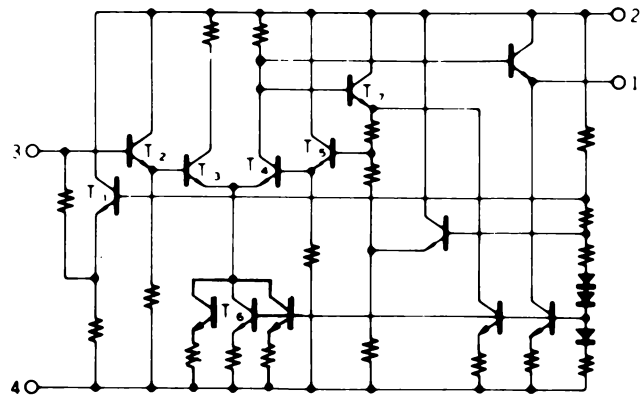


7.10 SSG SCHEMATIC DIAGRAM AND CIRCUIT BOARD

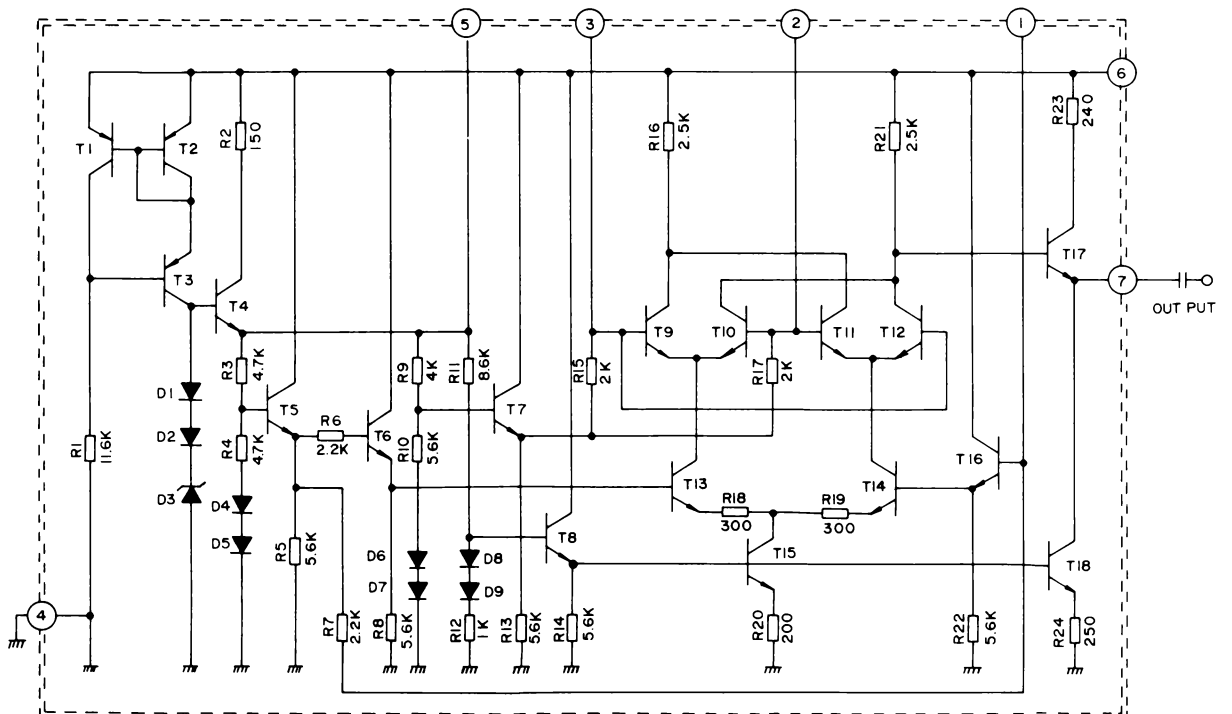


7.13 SCHEMATIC DIAGRAM OF INTEGRATED CIRCUITS

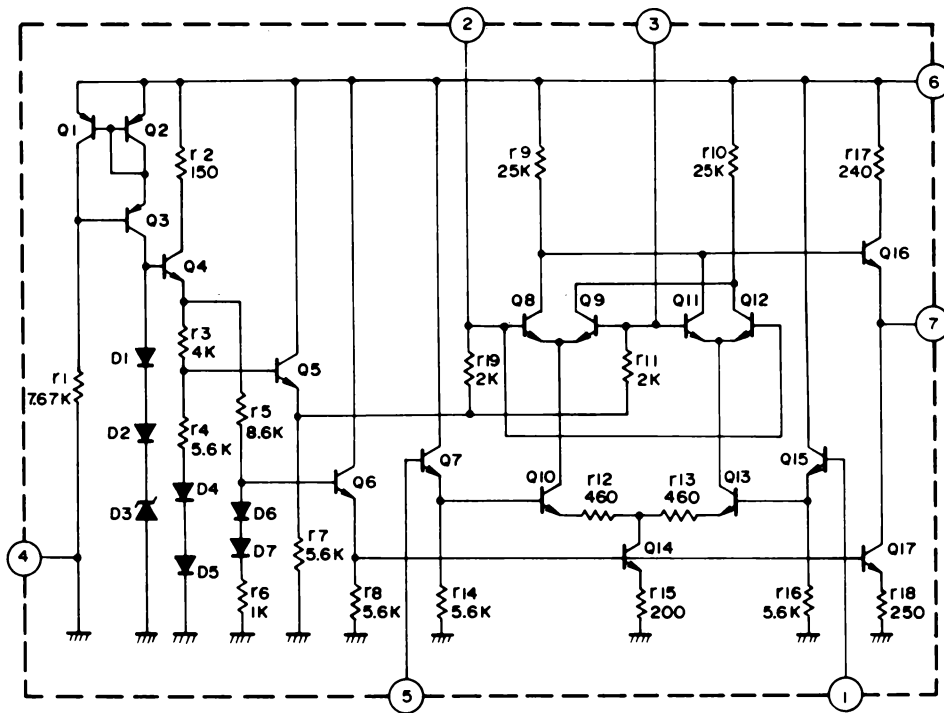
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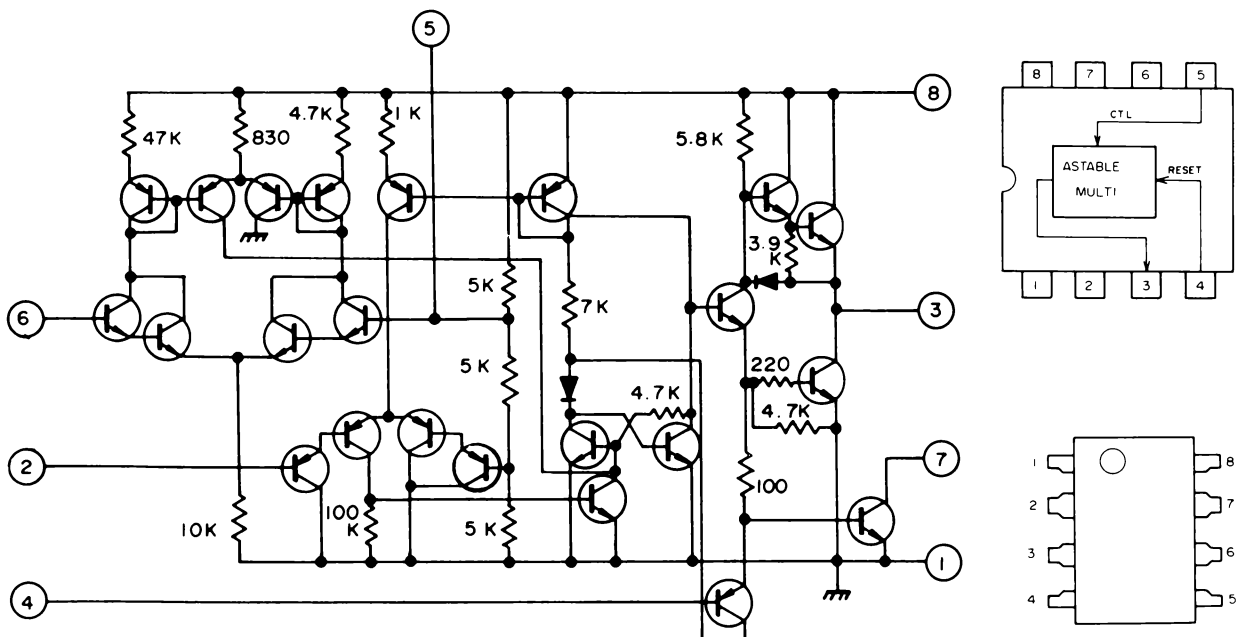
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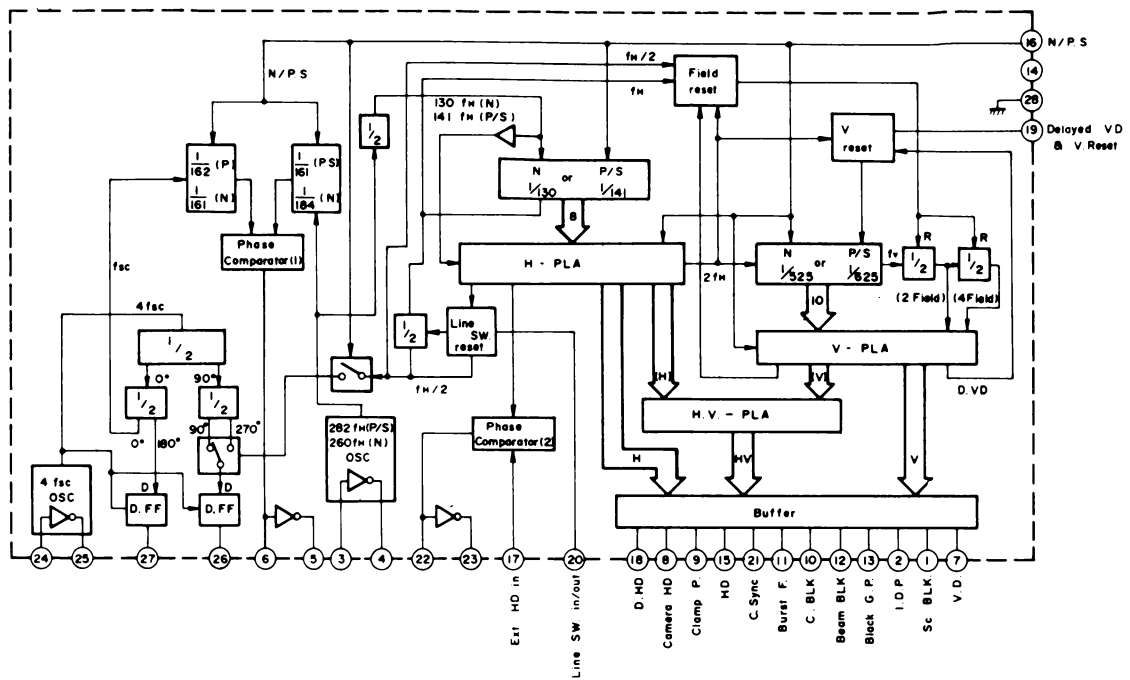
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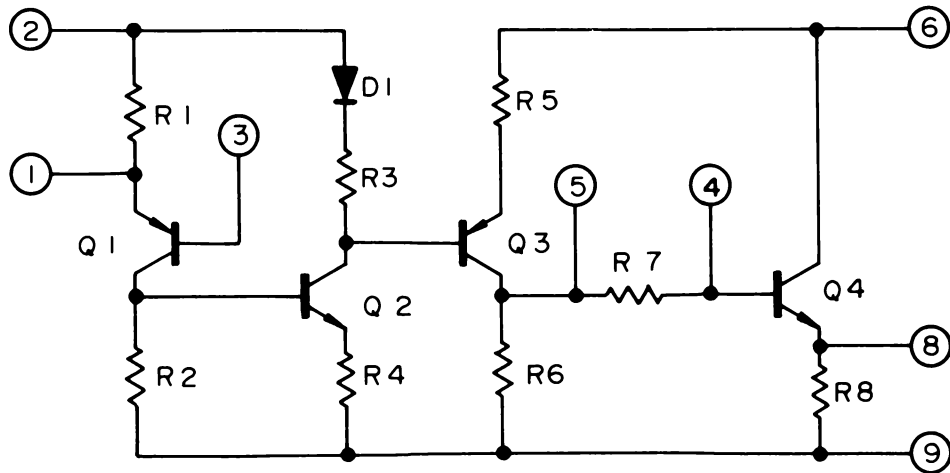
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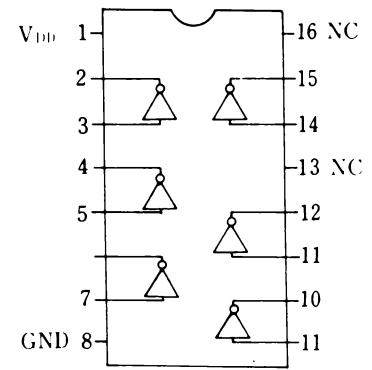
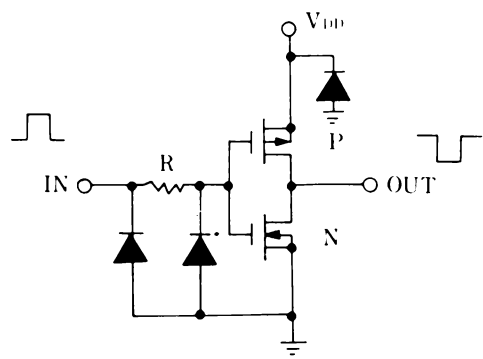
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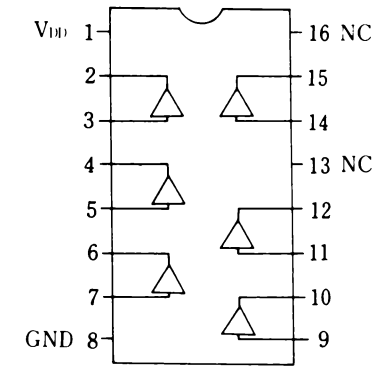
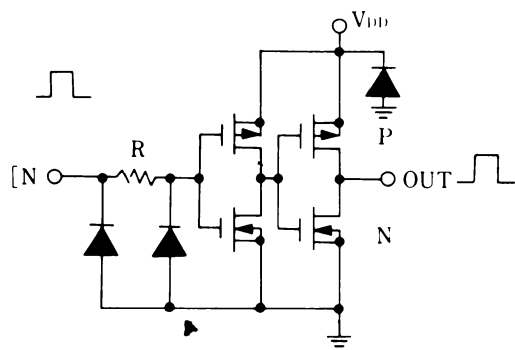
— KJ13A48 —



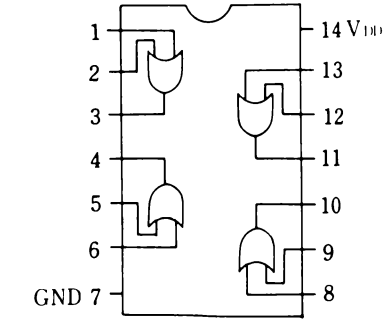
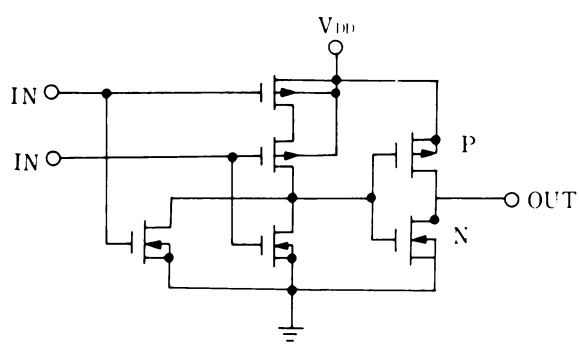
—MSM4049 —



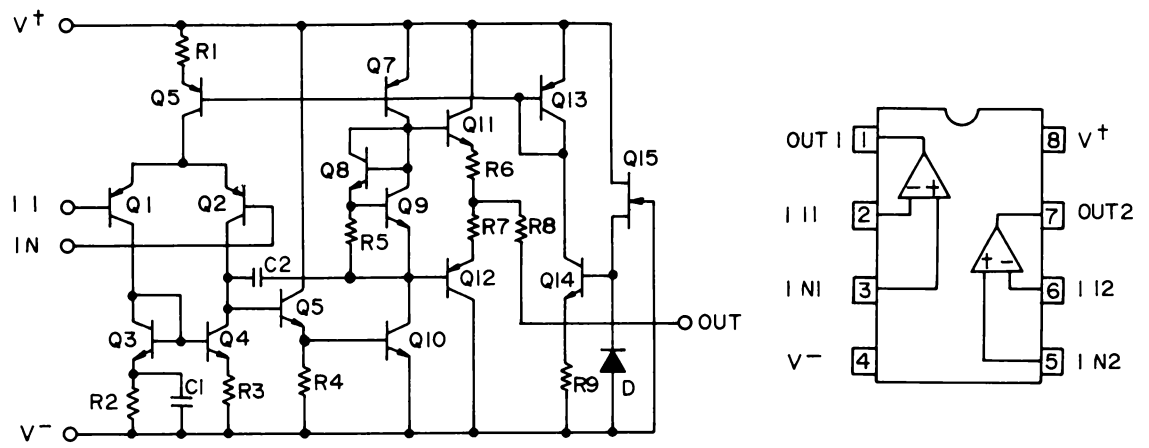
— MSM4050 —



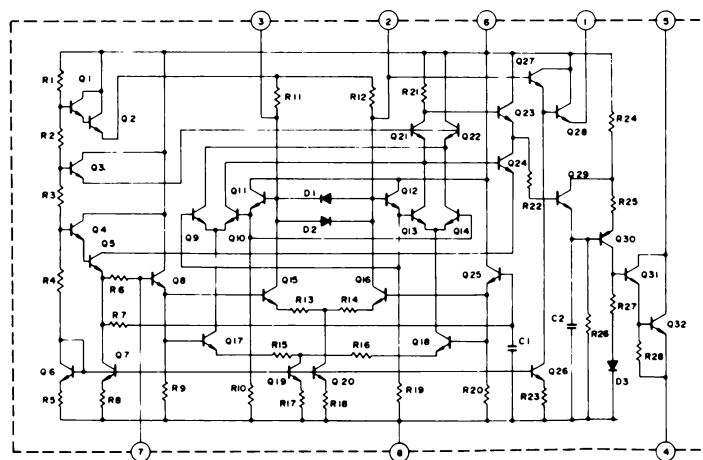
— MS4071 —



— UPC4558C —



— UPC596C —



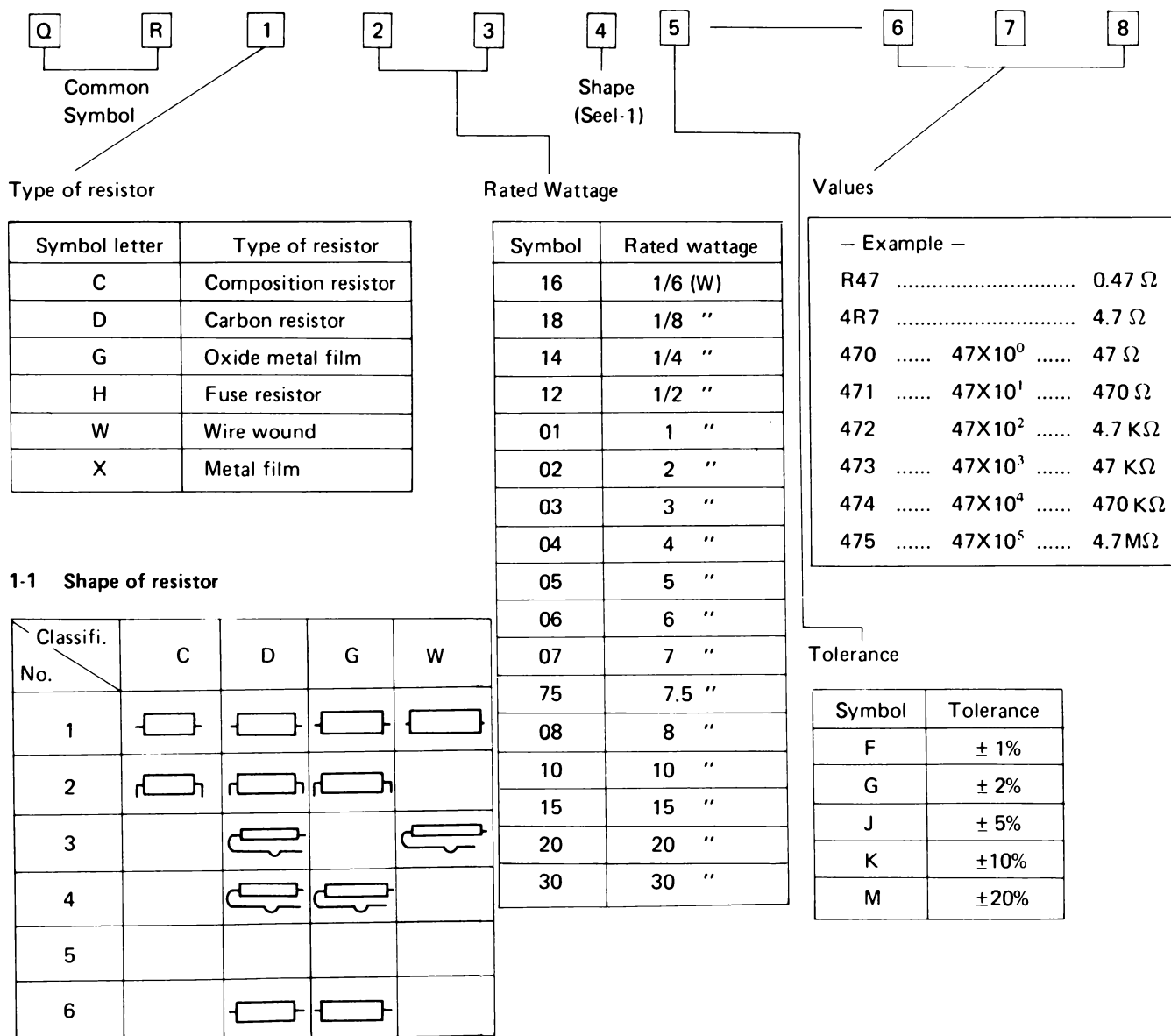
SECTION 8 ELECTRICAL PARTS LIST

1. SAFETY PRECAUTION

Parts identified by the Δ symbol are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

2. How to read the JVC standard parts numbers.

General rules for numbering method of standard parts (resistor)



Abbreviations in this list are as follows:

RESISTORS — All resistance values are in ohms (Ω).

K : 1 000

M 1 000 000

CR : Carbon Resistor

Comp. R: Composition Resistor

WR Wire Wound Resistor

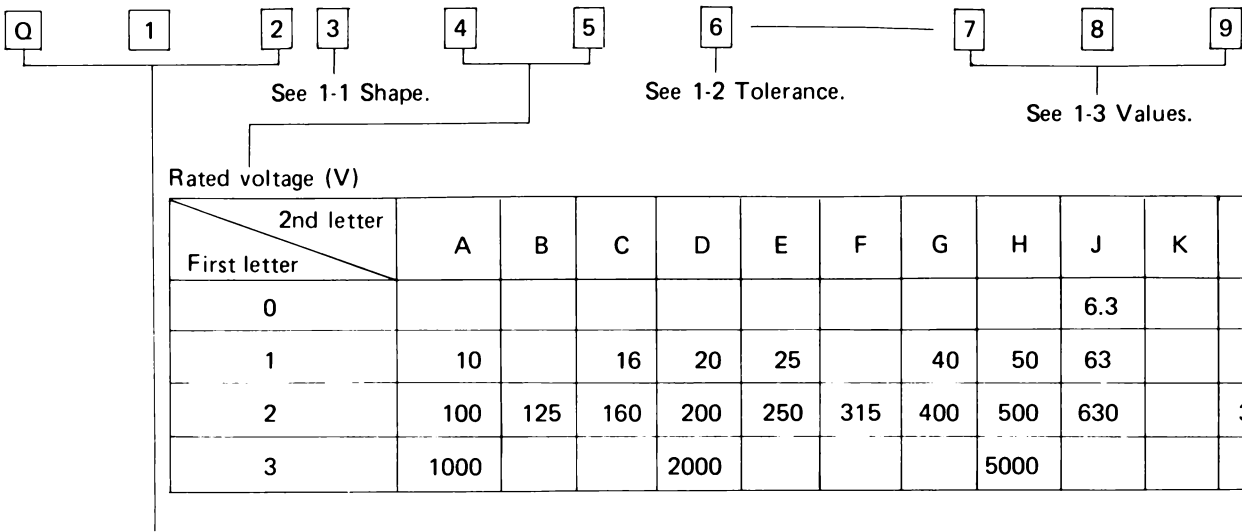
OMR Oxide Metal Film Resistor

VR Variable Resistor (Potentiometer)

MFR Metal Film Resistor

FR Fusible Resistor

General fules for numbering of standard parts (capacitor)



Type of capacitor

Symbol	Type of capacitor
QCF	Ceramic
QCS	"
QCY	"
QEA	Electrolytic
QED	"
QEE	Tantalum
QEN	Non-polar
QEW	Electrolytic
QFC	OF
QFF	Film mica
QFH	Metalized mylar
QFM	Mylar
QFP	Paper film
QFS	Polystyrole
QCT	Ceramic
QET	Electrolytic
QEV	Electrolytic

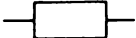
1-2 Tolerance

Symbol	J	K	M	Z	P	A	H
(%)	±5	±10	±20	+80 -20	+100 - 0	+100 - 10	+50 -10

1-3 Values

— Example — Values are in picofarad			
101	10X10 ¹		100 pF
102	10X10 ²		1,000 pF
103	10X10 ³		10,000 pF = 0.01 μF
104	10X10 ⁴		100,000 pF = 0.1 μF
5R0		10X10 ⁵	 5 pF

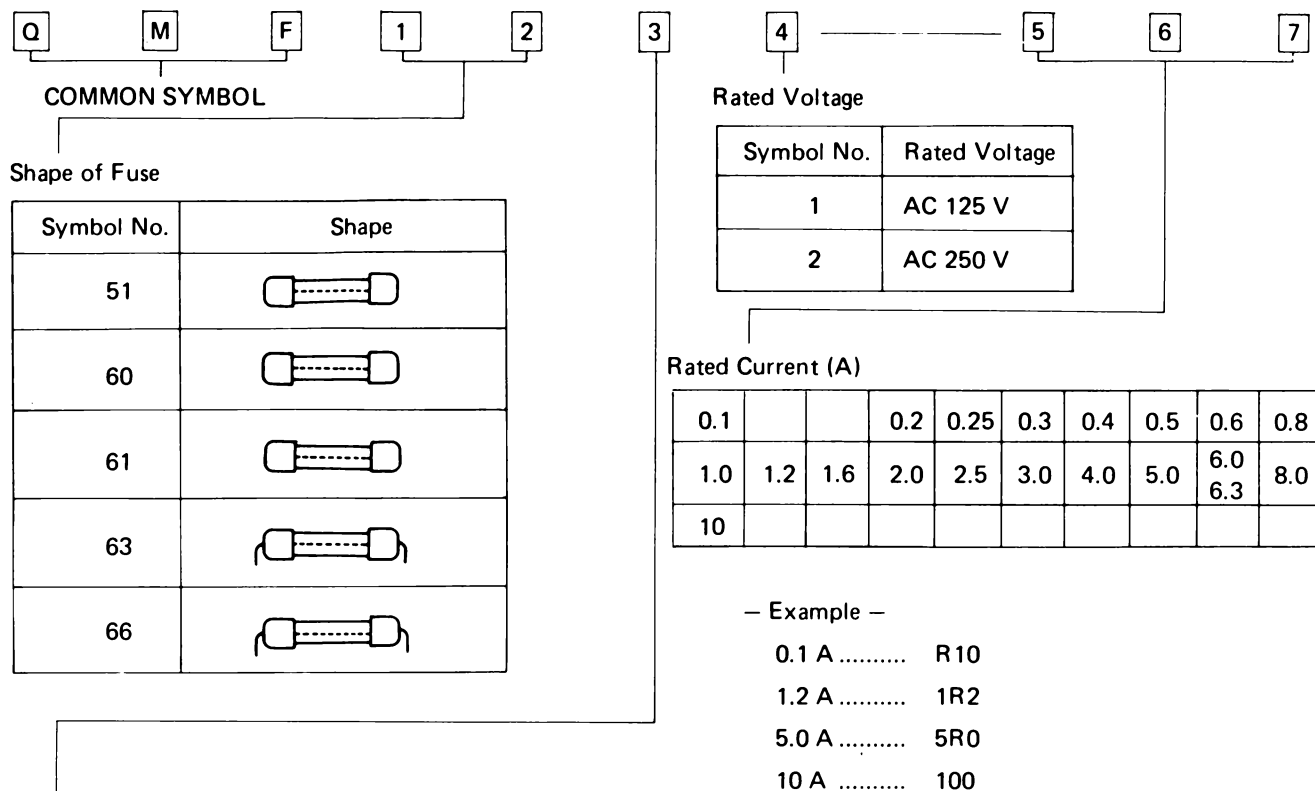
1-1 Shape of capacitor

1	
2	
3	Kink lead
4	

CAPACITORS -- All capacitance values are in μF, unless otherwise indicated.

- P μμF
- C Cap Ceramic Capacitor
- E Cap Electrolytic Capacitor
- FM Cap : Film Mica Capacitor
- MM Cap : Metalized Mylar Capacitor
- MP Cap Metalized Paper Capacitor
- MY Cap : Mylar Capacitor
- NP Cap : Non-polar Capacitor
- PC Cap Polycarbonate Capacitor
- PP Cap Poly Pro Capacitor
- PS Cap Polystyrol Capacitor
- T Cap Tantalum Capacitor
- TR Cap : Trimmer Capacitor

General rules for numbering method of standard parts (fuse)



Characteristics

Symbol No.	Fusing current	Fusing time	Remarks
S	160%	Within 1 hr.	UL type
	200%	Within 2 min.	
	800%—2000%	Within 0.01 sec.	
M	135%	Within 1 hr.	UL type
	200%	Within 2 min.	
U	135%	Within 1 hr.	UL type
	200%	Within 2 min.	
	800%—2000%	Within 0.01 sec.	
A	210%	Within 2 min.	Europe type
	275%	0.5—10 sec.	
	400%	0.15—0.3 sec.	
	1000%	0.02—0.3 sec.	
B	210%	Within 30 min.	SEMKO type (Europe)
	275%	0.05—2 sec.	
	400%	0.01—0.5 sec.	
	1000%	Within 0.02 sec.	

8.1 CAMERA P.W.B. ASS'Y PU47580C

Symbol No.	Part No.	Part Name	Description
	PU47573E	Video Process PWB Ass'y	REF: 8 - 2
	PU47574E	H/DEF PWB Ass'y	REF: 8 - 3
	PU47575E	SSG PWB Ass'y	REF: 8 - 4
	PU47577A	Pre. Amp. Ass'y	REF: 8 - 7
	PU47579A	Switch PWB Ass'y	REF: 8 - 8
	PU47578A	Vidicon Socket Ass'y	REF: 8 - 9
	PU48246A	VR PWB Ass'y	REF: 8 - 10
X001	2SB566C	Transistor	
D001	PU46267	L.E.D.	for IRIS
D002	PU44590	"	for REC

8.2 VIDEO PROCESS P.W.B. ASS'Y PU47573E

Symbol No.	Part No.	Part Name	Description
	PU20808	Video Process PWB	
IC 1	D225U11	IC	
IC 2	AN610	"	
IC 3	D226U09	"	
IC 4	D228U10	"	
IC 5	D327S15	"	
IC 6	D222U12A	"	
IC 7	KJ13C08	"	
IC 8	AN612	"	
IC 9	AN614	"	
IC10	AN612	"	
IC11	UPC596C	"	
IC12	D225U08A	"	
IC13	AN614	"	
IC14	AN612	"	
IC15	AN614	"	
IC16	AN612	"	
IC17	UPC596C	"	
IC18	D225U08A	"	
IC19	AN614	"	
X 1	2SK40C	F.E.T.	
D 1	1S2473	Diode	
D 2	MA26W	"	
D 3	MA26T-A	"	
D 4	"	"	
D 5	MA26W	"	
D 6	"	"	
D 7	1S2473	"	
D 8	"	"	
R 1	QRD181J-391A	CR	390 1/8 W
R 2	" -331A	"	330 "
R 3	" -222A	"	2.2 K "
R 4	" -332A	"	3.3 K "
R 5	" -682A	"	6.8 K "
R 6	" -682A	"	6.8 K "
R 7	-	-	
R 8	QRD181J-471A	CR	470 1/8 W
R 9	" -471A	"	470 "
R10	" -821A	"	820 "
R11	" -561A	"	560 "
R12	" -391A	"	390 "
R13	" -391A	"	390 "
R14	QRD141J-750	"	75 1/4 W
R15	QVZ3506-222	VR	
R16	" -222	"	
R17	" -221	"	
R18	QRD181J-151A	CR	150 1/8 W
R19	" -183A	"	18 K "
R20	" -471A	"	470 "
R21	QVZ3506-472	VR	
R22	QRD181J-682A	CR	6.8 K 1/8 W
R23	QVZ3506-222	VR	
R24	QRD181J-103A	CR	10 K 1/8 W
R25	" -472A	"	4.7 K "
R26	QVZ3506-103	VR	
R27	QRD181J-103A	CR	10 K 1/8 W
R28	" -821A	"	820 "
R29	" -223A	"	22 K "

Symbol No.	Part No.	Part Name	Description
R30	QVZ3506-223	VR	
R31	QRD181J-103A	CR	10 K 1/8 W
R32	QVZ3506-222	VR	
R33	QRD181J-152A	CR	1.5 K 1/8 W
R34	" -331A	"	330 "
R35	" -122A	"	1.2 K "
R36	" -221A	"	220 "
R37	" -121A	"	120 "
R38	" -122A	"	1.2 K "
R39	" -561A	"	560 "
R40	" -561A	"	560 "
R41	" -223A	"	22 K "
R42	—	—	
R43	QRD181J-103A	CR	10 K 1/8 W
R44	" -682A	"	6.8 K "
R45	" -332A	"	3.3 K "
R46	QVZ3506-472	VR	
R47	" -102	"	1 K
R48	QRD181J-152A	CR	1.5 K 1/8 W
R49	" -562A	"	5.6 K "
R50	" -472A	"	4.7 K "
R51	" -472A	"	4.7 K "
R52	" -122A	"	1.2 K "
R53	QVZ3506-104	VR	
R54	QRD181J-472A	CR	4.7 K 1/8 W
R55	QVZ3506-103	VR	
R56	QRD181J-103A	CR	10 K 1/8 W
R57	QRD143K-185	"	1.8 M 1/4 W
R58	QVZ3506-472	VR	
R59	QRD181J-472A	CR	4.7 K 1/8 W
R60	QVZ3506-222	VR	
R61	QRD181J-472A	CR	4.7 K 1/8 W
R62	" -223A	"	22 K "
R63	" -331A	"	330 "
R64	" -471A	"	470 "
R65	" -221A	"	220 "
R66	" -121A	"	120 "
R67	" -682A	"	6.8 K "
R68	" -332A	"	3.3 K "
R69	QRD187J-390A	"	39 "
R70	QRD181J-122A	"	1.2 K "
R71	QVZ3506-102	VR	
R72	" -681	"	
R73	QRD181J-103A	CR	10 K 1/8 W
R74	" -103A	"	10 K "
R75	" -682A	"	6.8 K "
R76	—	"	"
R77	QRD181J-103A	"	10 K "
R78	" -682A	"	6.8 K "
R79	" -332A	"	3.3 K "
R80	QVZ3506-472	VR	
R81	" -102	"	
R82	QRD181J-472A	CR	4.7 K 1/8 W
R83	" -472A	"	4.7 K "
R84	" -122A	"	1.2 K "
R85	" -472A	"	4.7 K "
R86	QVZ3506-103	VR	
R87	QRD181J-103A	CR	10 K 1/8 W
R88	QRD143K-185	"	1.8 M 1/4 W
R89	QVZ3506-472	VR	
R90	QRD181J-472A	CR	4.7 K 1/8 W
R91	QVZ3506-222	VR	2.2 K "
R92	QRD181J-472A	CR	4.7 K 1/8 W

Symbol No.	Part No.	Part Name	Description
R93	QRD181J-331A	CR	330 1/8 W
R94	" -471A	"	470 "
R95	" -221A	"	220 "
R96	" -121A	"	120 "
R97	" -682A	"	6.8 K "
R98	" -332A	"	3.3 K "
R99	" -101A	"	100 "
R100	" -561A	"	560 "
R101	" -4R7A	"	4.7 "
R102	" -123A	"	12 K "
R103	QRD187J-104A	"	100 K "
R104	QRD181J-104A	"	100 K "
R105	" -561A	"	560 "
R106	—	—	
R107	QRD181J-153A	CR	15 K 1/8 W
R108	—	—	
R109	—	—	
R110	QRD181J-334A	CR	330 K 1/8 W
R111	—	—	
R112	—	—	
R113	QVZ3506-104	VR	
R114	QRD181J-683A	CR	68 K 1/8 W
R115	" -472A	"	4.7 K "
R116	" -472A	"	4.7 K "
R117	QRD181J-392	CR	3.9 K 1/8 W
R118	" -392	"	3.9 K "
R119	" -680	"	68 "
R120	ERTD2FGL750S	Thermistor	
R121	QRD181J-222	CR	2.2 K 1/8 W
R122	" -682	"	6.8 K "
R123	" -332	"	3.3 K "
C 1	QEE40FM-107	Tan Cap	100 3 V
C 2	QET61AR-476M	E Cap	47 10 V
C 3	QEE81AM-476	Tan Cap	47 "
C 4	QEE41EM-105	"	1 25 V
C 5	QCS31HJ-391	C Cap	390 P 50 V
C 6	" -680	"	68 P "
C 7	QEE41CM-106	Tan Cap	10 16 V
C 8	QCS31HJ-101	C Cap	100 P 50 V
C 9	QET61AR-107M	E Cap	100 10 V
C10	QEE81AM-476	Tan Cap	47 "
C11	—	—	
C12	PU47596-400	Trimmer Cap	40 P
C13	" -400	"	40 P
C14	—	—	
C15	QCF31HP-103	C Cap	0.01 50 V
C16	" -103	"	0.01 "
C17	" -103	"	0.01 "
C18	" -103	"	0.01 "
C19	" -103	"	0.01 "
C20	" -103	"	0.01 "
C21	QEE41CM-106	Tan Cap	10 16 V
C22	QCF31HP-103	C Cap	0.01 50 V
C23	" -103	"	0.01 "
C24	" -103	"	0.01 "
C25	QCS31HJ-270	"	27 P "
C26	QET61CR-106M	E Cap	10 16 V
C27	QET61AR-476M	"	47 10 V
C28	QET61CR-106M	"	10 16 V
C29	QCF31HP-103	C Cap	0.01 50 V
C30	" -103	"	0.01 "
C31	" -103	"	0.01 "

8.3 H/DEF P.W.B. ASS'Y PU47574E

Symbol No.	Part No.	Part Name	Description
C32	QCF31HP-103	C Cap	0.01 50 V
C33	QEE41CM-106	Tan Cap	10 16 V
C34	QCF31HP-103	C Cap	0.01 50 V
C35	" -103	"	0.01 "
C36	" -103	"	0.01 "
C37	QFM31HJ-102	MY Cap	0.001 "
C38	QCS31HJ-270	C Cap	27 P "
C39	QET61CR-106M	E Cap	10 16 V
C40	QET61AR-476M	"	47 10 V
C41	QET61CR-106M	"	10 16 V
C42	QCF31HP-103	C Cap	0.01 50 V
C43	QEE41CM-475	Tan Cap	4.7 16 V
C44	QET61CR-107M	E Cap	100 "
C45	QCF31HP-223	C Cap	0.022 50 V
C46	QET61CR-107M	E Cap	100 16 V
C47	QCF31HP-223	C Cap	0.022 50 V
C48	" -223	"	0.022 "
C49	QCF11HP-223	"	0.022 "
C50	QCF31HP-223	"	0.022 "
C51	" -223	"	0.022 "
C52	" -223	"	0.022 "
C53	" -223	"	0.022 "
C54	" -223	"	0.022 "
C55	" -223	"	0.022 "
C56	—	—	
C57	QCS11HJ-470	C Cap	47 P 50 V
C58	QFM31HJ-102	MY Cap	0.001 "
C59	QFM41HJ-102	"	0.001 "
L 1	A04096-150	Peaking Coil	
L 2	PU30770-4	Coil	
L 3	—	—	
L 4	A04096-15	Peaking Coil	
L 5	PU30770-4	"	
L 6	" -7	"	
L 7	—	—	
L 8	PU30770-4	Coil	
L 9	" -7	"	
L10	—	—	
LPF 1	PU31932-1	Filter	
LPF 2	PU32141-1	"	
LPF 3	PU32140-1	"	
LPF 4	" -1	"	
BPF 1	PU32142-1	Filter	
EQ 1	PU31933-1	Filter	
DL 1	PU48200	1H Delay Line	
	PU43351-2	Cap Housing	P2

Symbol No.	Part No.	Part Name	Description
	PU20809	P.W.B.	
IC 1	AN374P	IC	
IC 2	"	"	
IC 3	D117A47	"	
IC 4	D228W20	"	
IC 5	D328W21	"	
IC 6	UPC1458C	"	
IC 7	5HC1	"	
IC 8	209E37	"	
IC 9	712E36	"	
X 1	2SD638R	Transistor	
X 2	2SB643R	"	
X 3	2SC1567Q	"	
X 4	2SD638R	"	
X 5	2SB643R	"	
X 6	2SC1384Q	"	
X 7	"	"	
X 8	2SD638R	"	
X 9	—	—	
X10	2SB641Q	Transistor	
X11	2SD636Q	"	
X12	2SB641Q	"	
X13	2SD636Q	"	
D 1	GH-1F	Diode	
△D 2	SM-1-08	"	
△D 3	"	"	
△D 4	"	"	
D 5	1S2473VE	"	
D 6	"	"	
D 7	RD7.5EB	Zener Diode	
R 1	QRD181J-221A	CR	220 1/8 W
R 2	" -182A	"	1.8 K "
R 3	—	—	
R 4	QRD181J-222A	CR	2.2 K 1/8 W
R 5	" -222A	"	2.2 K "
R 6	QVZ3506-222	VR	
R 7	QRD181J-561A	CR	560 1/8 W
R 8	" -101A	"	100 "
R 9	QVZ3506-222	VR	
R10	QRD181J-473A	CR	47 K 1/8 W
R11	" -473A	"	47 K "
R12	" -271A	"	270 "
R13	QVZ3506-471	VR	
R14	QRD181J-150A	CR	15 1/8 W
R15	" -101A	"	100 "
R16	" -222A	"	2.2 K "
R17	QVZ3506-222	VR	
R18	QRD181J-561A	CR	560 1/8 W
R19	QRD142J-330	"	33 1/4 W
R20	QRD181J-151A	"	150 1/8 W
R21	" -473A	"	47 K "
R22	" -473A	"	47 K "
R23	" -682A	"	6.8 K "
R24	QVZ3506-153	VR	
R25	" -103	"	

Symbol No.	Part No.	Part Name	Description
R26	QRD181J-103A	CR	10 K 1/8 W
R27	" -103A	"	10 K "
R28	" -104A	"	100 K "
R29	" -153A	"	15 K "
R30	QVZ3507-105	VR	
R31	QRD181J-563A	CR	56 K 1/8 W
R32	" -394A	"	390 K "
R33	" -104A	"	100 K "
R34	" -563A	"	56 K "
R35	" -103A	"	10 K "
R36	QVZ3506-473	VR	
R37	QRD181J-103A	CR	10 K 1/8 W
R38	QVZ3506-473	VR	
R39	QRD181J-471A	CR	470 1/8 W
R40	" -102A	"	1 K "
R41	" -103A	"	10 K "
R42	QRZ3506-473	VR	
R43	QRD181J-103A	CR	10 K 1/8 W
R44	QVZ3506-473	VR	
R45	QRD181J-152A	CR	1.5 K 1/8 W
R46	QVZ3506-471	VR	
R47	QRD181J-331A	CR	330 1/8 W
R48	" -334A	"	330 K "
R49	—	—	
R50	QRV121F-1504M	C.M.F.	1.5 M 1/2 W
R51	" -1504M	"	1.5 M "
R52	QVZ3501-684	VR	
R53	QRV121F-8203M	C.M.F.	820 K 1/2 W
R54	QRD181J-474A	CR	470 K 1/8 W
R55	" -102A	"	1 K "
R56	QVZ3501-224	VR	
R57	QRD181J-102A	CR	1 K 1/8 W
R58	" -151A	"	150 "
R59	" -151A	"	150 "
R60	" -102A	"	1 K "
R61	" -562A	"	5.6 K "
R62	" -223A	"	22 K "
R63	" -104A	"	100 K "
R64	QVZ3506-104	VR	
R65	QRD181J-104A	CR	100 K 1/8 W
R66	" -103A	"	10 K "
R67	" -104A	"	100 K "
R68	" -222A	"	2.2 K "
R69	" -822	"	8.2 K "
R70	" -562A	"	5.6 K "
R71	" -101A	"	100 "
R72	PU47597-202	VR	
R73	QRD181J-472A	CR	4.7 K 1/8 W
R74	QVZ3506-222	VR	
R75	—	—	
R76	—	—	
R77	QRD181J-152A	CR	1.5 K 1/8 W
R78	" -821A	"	820 "
R79	" -103A	"	10 K "
R80	QVZ3506-473	VR	
R81	QRD181J-103A	CR	10 K 1/8 W
R82	QVZ3506-473	VR	
R83	QRD181J-100A	CR	10 1/8 W
R84	—	—	
R85	QRD181J-393A	CR	39 K 1/8 W
R86	—	—	
R87	—	—	
R88	—	—	

Symbol No.	Part No.	Part Name	Description
R89	—	—	
R90	QRD181J-103A	CR	10 K 1/8 W
R91	" -103A	"	10 K "
R92	QVZ3506-473	VR	
R93	" -473	"	
R94	QRD181J-393A	CR	39 K 1/8 W
R95	QVZ3506-153	VR	15 K
R96	QRD181J-393	CR	39 K 1/8 W
C 1	QEE41CM-106	Tan Cap	10 16 V
C 2	QFM31HJ-272	MY Cap	0.0027 50 V
C 3	" -332	"	0.0033 "
C 4	QEC81AM-227	E Cap	220 10 V
C 5	QET61AR-107M	"	100 "
C 6	QEE41CM-106	Tan Cap	10 16 V
C 7	QEE41VM-474	"	0.47 35 V
C 8	QFM41HJ-152	MY Cap	0.0015 50 V
C 9	QCF31HP-223	C Cap	0.022 50 V
C10	" -103	"	0.01 "
C11	QEV40JR-477M	E Cap	470 6.3 V
C12	QFM31HJ-153	MY Cap	0.015 50 V
C13	QFM41HJ-563	"	0.056 "
C14	QEE81AM-476	Tan Cap	47 10 V
C15	" -476	"	47 "
C16	QCF31HP-103	C Cap	0.01 50 V
C17	QEE81AM-476	Tan Cap	47 10 V
C18	QEV41HR-105M	E Cap	1 50 V
C19	QEE81AM-476	Tan Cap	47 10 V
C20	QEV41HR-475M	E Cap	4.7 50 V
C21	QEE41CM-106	Tan Cap	10 16 V
C22	" -106	"	10 "
C23	QEE81AM-476	"	47 10 V
C24	" -476	"	47 "
△ C25	QFM42GK-333	MY Cap	0.0033 400 V
△ C26	QFM52BK-103	M.M. Cap	0.01 125 V
△ C27	QFM42GK-103	MY Cap	0.01 400 V
△ C28	QEW62CA-105	E Cap	1 160 V
△ C29	QFH42GK-104	M.M. Cap	0.1 400 V
△ C30	" -104	"	0.1 "
△ C31	QEW42CA-475	E Cap	4.7 160 V
△ C32	" -475	"	4.7 "
C33	QEV41AR-477M	"	470 10 V
C34	QEE81AM-476	Tan Cap	47 "
C35	" -476	"	47 "
C36	QET61HR-105M	E Cap	1 50 V
C37	QET61ER-107M	"	100 25 V
C38	QET61CR-476M	"	47 16 V
C39	QFM31HJ-473	MY Cap	0.047 50 V
C40	—	—	
C41	QEV41AR-477M	E Cap	470 10 V
C42	QEE81AM-476	Tan Cap	47 "
C43	QET61CR-476M	E Cap	47 16 V
C44	—	—	
C45	QEV41CR-227M	E Cap	220 16 V
C46	QEV61HR-335M	"	3.3 50 V
L 1	PU30284-67RN	Choke Coil	
L 2	PU42875-271	Peaking Coil	
L 3	PU43159	"	

8.4 S.S.B. P.W.B. ASS'Y PU47575E

Symbol No.	Part No.	Part Name	Description
T 1	PU46881	Transformer	
⚠ T 2	PU47594	DC-DC Conv. Trans.	
FC 1	A44594-001	Fuse Clip	
⚠ F 1	QMF51A1-1R0	Fuse	1 A
	PU43351-3	Cap Housing	P3, 5
	" -4	"	P6
	" -6	"	P4
S 1	PU47598	Rotary Switch	

Symbol No.	Part No.	Part Name	Description
	PU32137-2	S.S.G. P.W.B.	
IC 1	HD44007	IC	
IC 2	MSM4049	"	(or UPD4049C)
IC 3	MSM4050	"	(or UPD4050C)
IC 4	HA17555PS	"	
IC 5	MSM4071	"	(or UPD4071C)
D 1	RD6.8EB1	Zener Diode	
D 2	1SV68	Diode	
R 1	QRD181J-473A	CR	47 K 1/8 W
R 2	" -680A	"	68 "
R 3	" -105A	"	1 M "
R 4	" -104A	"	100 K "
R 5	" -223A	"	22 K "
R 6	" -105A	"	1 M "
R 7	" -105A	"	1 M "
R 8	" -222A	"	2.2 K "
R 9	" -682A	"	6.8 K "
R10	QRD187J-4R7A	"	4.7
C 1	QEE81AM-476	Tan Cap	47 10 V
C 2	QFM41HJ-102	MY Cap	0.001 50 V
C 3	QCF11EZ-103	C Cap	0.01 25 V
C 4	QEE81AM-476	Tan Cap	47 10 V
C 5	QCT05CH-330	C Cap	33 P
C 6	QCF11EZ-103	"	0.01 25 V
C 7	" -103	"	0.01 "
C 8	—	—	
C 9	—	—	
C10	QEE41VM-474	Tan Cap	0.47 35 V
C11	" -474	"	0.47 "
C12	QCT05CH-220	C Cap	22 P
C13	QFF41HJ-120	Mica Cap	12 P
C14	QAT3001-011	Trimmer Cap	
L 1	PU32139-3	Coil	
S 1	PU47599	Switch	
X'tal 1	PU47145	Crystal	

8.5 MIC AMP P.W.B. ASS'Y PU48552A

Symbol No.	Part No.	Part Name	Description
	PU48553	P.W.B.	
IC 1	UPC4558C	IC	
R 1	QRD187J-222A	CR	2.2 K 1/8 W
R 2	" -104A	"	100 K "
R 3	" -104A	"	100 K "
R 4	" -102A	"	1 K "
R 5	" -334A	"	330 K "
R 6	" -101A	"	100 "
R 7	" -221A	"	220 "
C 1	QEE41VM-154	Tan Cap	0.15 35 V
C 2	QCS11HJ-151	C Cap	150 P 50 V
C 3	QEE81AM-476	Tan Cap	47 10 V
C 4	QEE41AM-106	"	10 50 V

8.6 COLOUR COMP. P.W.B. ASS'Y. PU48502B

Symbol No.	Part No.	Part Name	Description
	PU48501	Color Comp. P.W.B.	
IC 1	AN612	IC	
IC 2	UPC596C	"	
IC 3	AN608P		
R 1	QRD187J-123A	CR	12 K 1/8 W
R 2	" -561A	"	560 "
R 3	" -122A	"	1.2 K "
R 4	" -222A	"	2.2 K "
R 5	" -222A	"	2.2 K "
R 6	QVZ3508-223	VR	
R 7	QRD187J-182A	CR	1.8 K 1/8 W
R 8	QVZ3506-102	VR	
R 9	QRD187J-473A	CR	47 K 1/8 W
C 1	QFM41HK-102	MY Cap	0.001 50 V
C 2	QCS11HJ-820	C Cap	82 P "
C 3	QEE40JM-106	Tan Cap	10 6.3 V
C 4	" -106	"	10 "
C 5	QFM41HK-102	MY Cap	0.001 50 V
C 6	QEE40JM-106	Tan Cap	10 6.3 V
C 7	" -106	"	10 "
C 8	QFM41HK-152	MY Cap	0.0015 50 V
C 9	QEE41CM-106	T Cap	10 16 V
C10	QCF11HP-102	C Cap	0.001 50 V
C11	QCS11HJ-680	"	68 P "
DL 1	PU48557-2 PU433351-6	1H Delay Line Cap Housing	(or PU48572-2) 7 P

8.7 PRE AMP P.W.B. ASS'Y PU47577A

Symbol No.	Part No.	Part Name	Description
	PU47570	P.W.B.	
IC 1	KJ13A48	IC	
X 1	2SK218RS	F.E.T.	
R 1	QRD187J-225	CR	2.2 M 1/8 W
R 2	" -105	"	1 M "
R 3	QRD181J-221	"	220 "
R 4	" -270A	"	27 "
R 5	" -680A	"	68 "
R 6	" -271A	"	270 "
R 7	" -104A	"	100 K "
R 8	" -562A	"	5.6 K "
R 9	—	—	
R10	QRD181J-101A	CR	100 1/8 W
R11	" -334A	"	330 K "
C 1	QEW62AA-105	E Cap	1 100 V
C 2	QFM42AK-273	MY Cap	0.027 "
C 3	QCT25CH-150	C Cap	15 P
C 4	QAT3001-011	Trimmer Cap	
C 5	QEE40JM-476	Tan Cap	47 6.3 V
C 6	QEE40FM-107	"	100 3 V
C 7	QEE40JM-476	"	47 6.3 V
C 8	QEE41VM-474	"	0.47 35 V
C 9	PU48008	C Cap	
L 1	PU47908	Persival Coil	
L 2	A04096-220	Peaking Coil	

8.8 SWITCH P.W.B. ASS'Y..... PU47579A

Symbol No.	Part No.	Part Name	Description
	PU47580E	P.W.B.	
	PU48248	Slide Switch	
R 1	QRD187J-223A	CR	22 K 1/8 W
R 2	" -333A	"	33 K "
R 3	" -393A	"	39 K "
R 4	QRD187J-333A	"	33 K "
R 5	" -333A	"	33 K "
R 6	" -333A	"	33 K "
R 7	QRD187J-334A	"	330 K "
R 8	" -274A	"	270 K "
R 9	" -224A	"	220 K "
R10	" -154A	"	150 K "

8.9 VIDICON SOCKET P.W.B. ASS'Y. . . PU47578A

Symbol No.	Part No.	Part Name	Description
	PU47571	P.W.B.	
⚠	PU47604	Vidicon Socket	
D 1	RD3.0F.B	Zener Diode	
R 1	QRD141J-475	CR	4.7 M 1/4 W
R 2	QRV121F-4704M	CMF. R	4.7 M 1/2 W
⚠ C 1	PU47600-223J0	PP Cap	

8.10 VR P.W.B. ASS'Y PU48246A

Symbol No.	Part No.	Part Name	Description
	PU48209	VR P.W.B.	
R 1	QRD187J-183	CR	18 K 1/8 W
R 2	PU48247	VR	
R 3	QRD187J-183	CR	18 K 1/8 W

No. 8153

JVC Service Manual



MODEL GA-23E

VICTOR COMPANY OF JAPAN, LIMITED

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SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual provides service information for the JVC Camera Adapter Model GA-23EG and GA-23EK.

The manual describes the principles and adjustments of mechanical/electrical operations.

Service procedures given herein cover only field maintenance services. Adjustments which require high-level instruments, jigs and techniques are excluded, since they should be performed at a JVC Regional Center for factory service.

Due to design modifications, the servicing procedures and data given in this manual are subject to possible change without prior notice.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

1.2 SPECIFICATIONS

Rated output voltage : DC 12 V

Rated output current : 1.1 A

Remote control : Provided for the connection of a recorder having pause remote control capability.

Power requirement : 110/120/220/240 V $\sim$ (selectable), 50 Hz

Power consumption : 30 W

Operating temperature: 0°C ~ 40°C (32°F ~ 104°F)

Dimensions : 105(W) x 87(H) x 207(D) mm
(4-3/16" x 3-7/16" x 8-3/16")

Weight : 1.5 kg (3.4 lbs.)

Accessories : Video/Audio cable; PU47356A
Remote control cable; PU46315
Power cord; QMP3950-183 (EG)
PU46128-BS (EK)
Instructions; PU30425-282 (EG)
PU30425-283 (EK)

1.3 PRECAUTIONS

- Be careful NOT to block the ventilation openings. Heat is generated inside the unit.
- Do NOT use the unit stood up vertically or turned upside down.
- Do NOT apply violent shocks to the unit.
- Do NOT carry the unit while it remains connected to the camera or recorder.
- Do NOT disassemble the unit nor remove the cabinet.
- Do NOT allow inflammables, water or metallic objects to enter the unit.

POWER SYSTEM

Connection to the mains supply

The operating voltage of this camera adapter is preset to 220 V or 240 V $\sim$ at the factory. Before connecting to mains, check that the voltage selector on the rear panel is set to the same voltage as your local mains supply.

Adapting to local power line

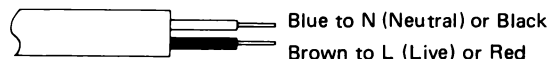
This camera adapter operates on either 110, 120, 220 or 240 V $\sim$. If the preset voltage differs from that in your area, insert a small screwdriver into the slot and turn the voltage selector so that correct voltage is aligned with the arrow. Regarding this setting, consult your JVC dealer.

IMPORTANT (In the United Kingdom)

Mains Supply (AC 240 V $\sim$, 50 Hz only)

IMPORTANT

Do not make any connection to the Larger Terminal coded E or Green. The wires in the mains lead are coloured in accordance with the following code:



If these colours do not correspond with the terminal identification of your plug, connect as follows: Blue wire to terminal coded N (Neutral) or coloured Black. Brown wire to terminal coded L (Live) or coloured Red.

Note:

We recommend that you should disconnect the AC cord from the outlet.

1.4 CONTROLS AND CONNECTORS

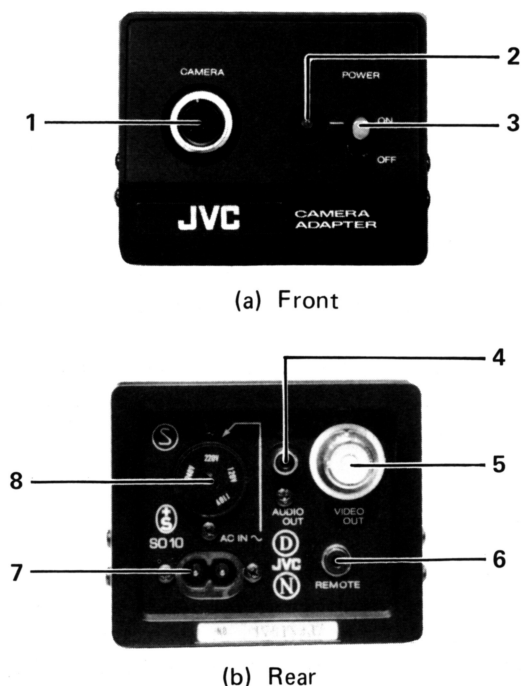


Fig. 1-1

- 1 **CAMERA terminal**
Connect the camera cable to this terminal.
- 2 **Power indicator**
Lights red when the POWER switch is set to ON.
- 3 **POWER switch**
Set to ON to supply power and to OFF to remove power.
- 4 **AUDIO OUT terminal**
Audio signals from the camera are available from this terminal
- 5 **VIDEO OUT terminal**
Video signals from the camera are available from this terminal.
- 6 **REMOTE terminal**
Connect to the PAUSE REMOTE terminal of the VHS recorder using the remote control cable provided.
- 7 **AC IN socket**
Connect to an AC outlet using the power cord provided.
- 8 **Voltage selector**
Set to the power supply voltage in your area.

1.5 CONNECTION

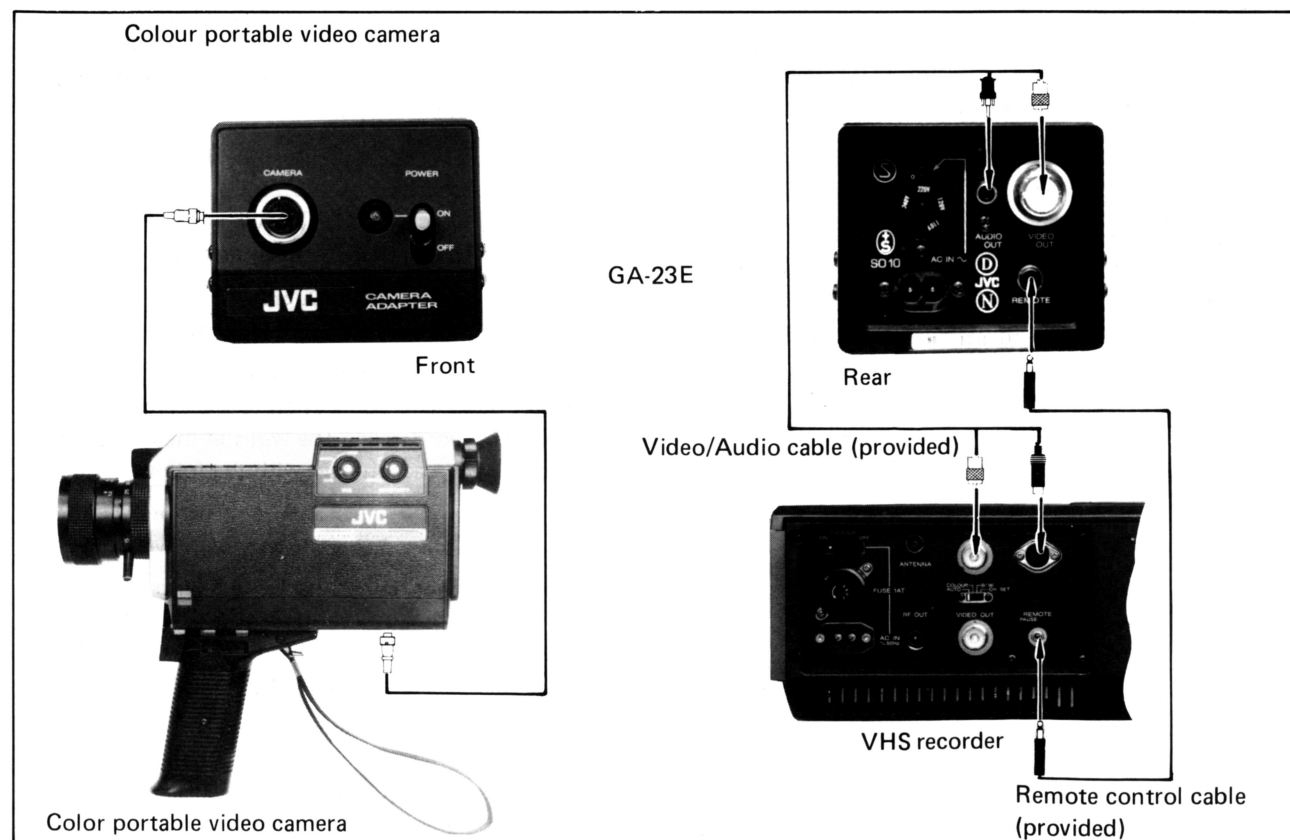


Fig. 1-2

1. Connect the camera cable to the CAMERA connector of this unit.
2. Connect the two plugs of the supplied video/audio cable on one end to the VIDEO OUT and AUDIO OUT terminals.
3. Connect the two plugs on the other end to the VIDEO IN and AUDIO IN terminals of the recorder.
4. Using the supplied remote control cable, connect between the REMOTE terminal of this unit and the PAUSE REMOTE terminal of the recorder.
(HR-3600E)

The HR-3300E is not supplied with a remote control terminal, so the camera's start/stop switch does not function when used in combination with the HR-3300E.

5. Depress the recorder's REC and PLAY keys simultaneously.
6. Start recording by setting the camera's start/stop switch to START.

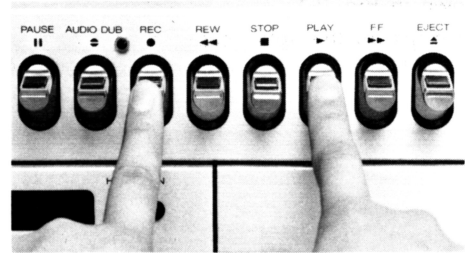


Fig. 1-6

1.6 OPERATION

With the HR-3600E

1. Power the adapter, recorder and TV receiver.



Fig. 1-3

2. Set the recorder's REC SELECT switch to AUX.
3. Select the TV receiver channel that corresponds to the RF converter output.

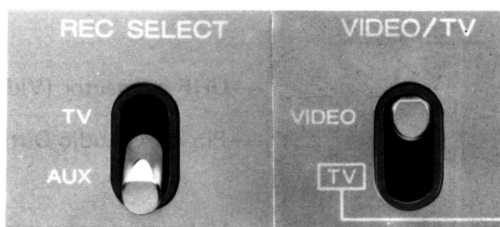


Fig. 1-4

4. Make sure that the camera's start/stop switch is set to STOP.

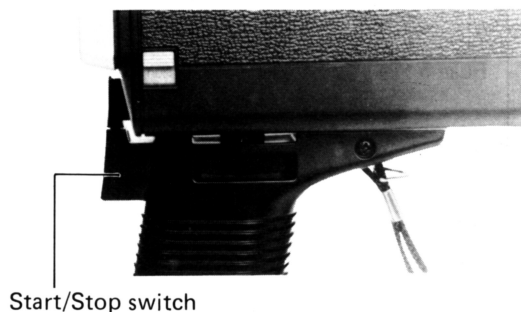


Fig. 1-5

SECTION 2 DISASSEMBLY

1. Remove the four screws ① on the upper case as shown in Fig. 2-1. Then lift up the upper case.
2. Remove the two screws ② on the lower case as shown in Fig. 2-2, and then put off the lower case.

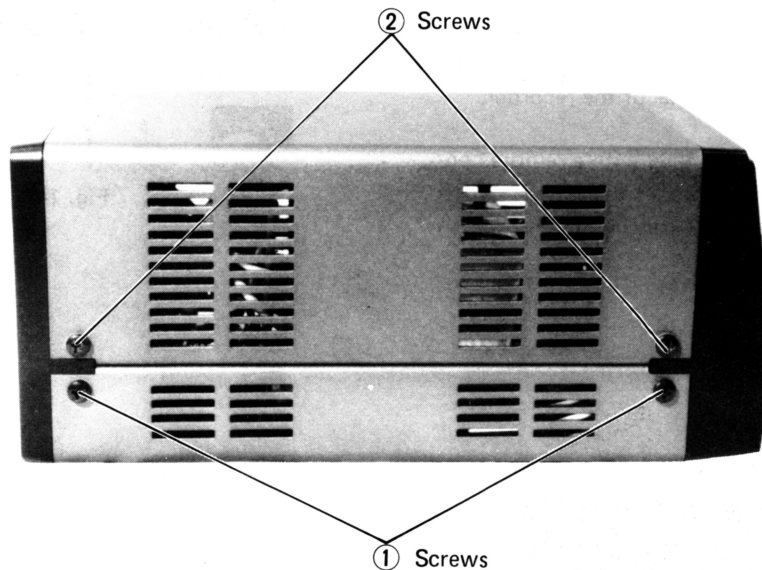


Fig. 2-1

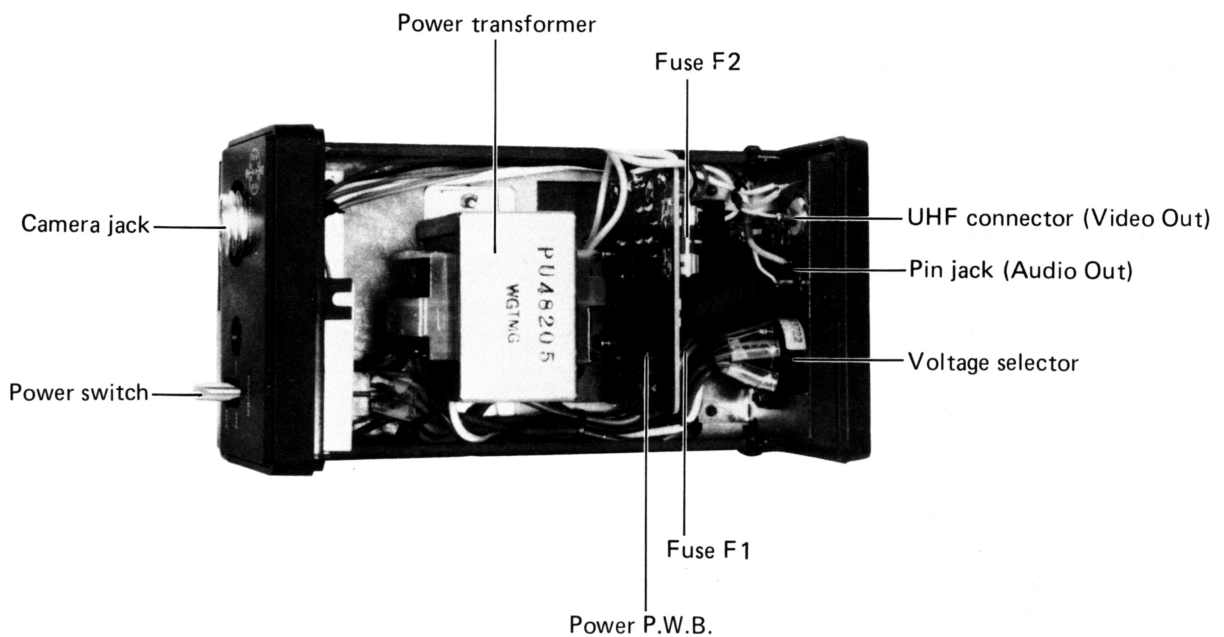
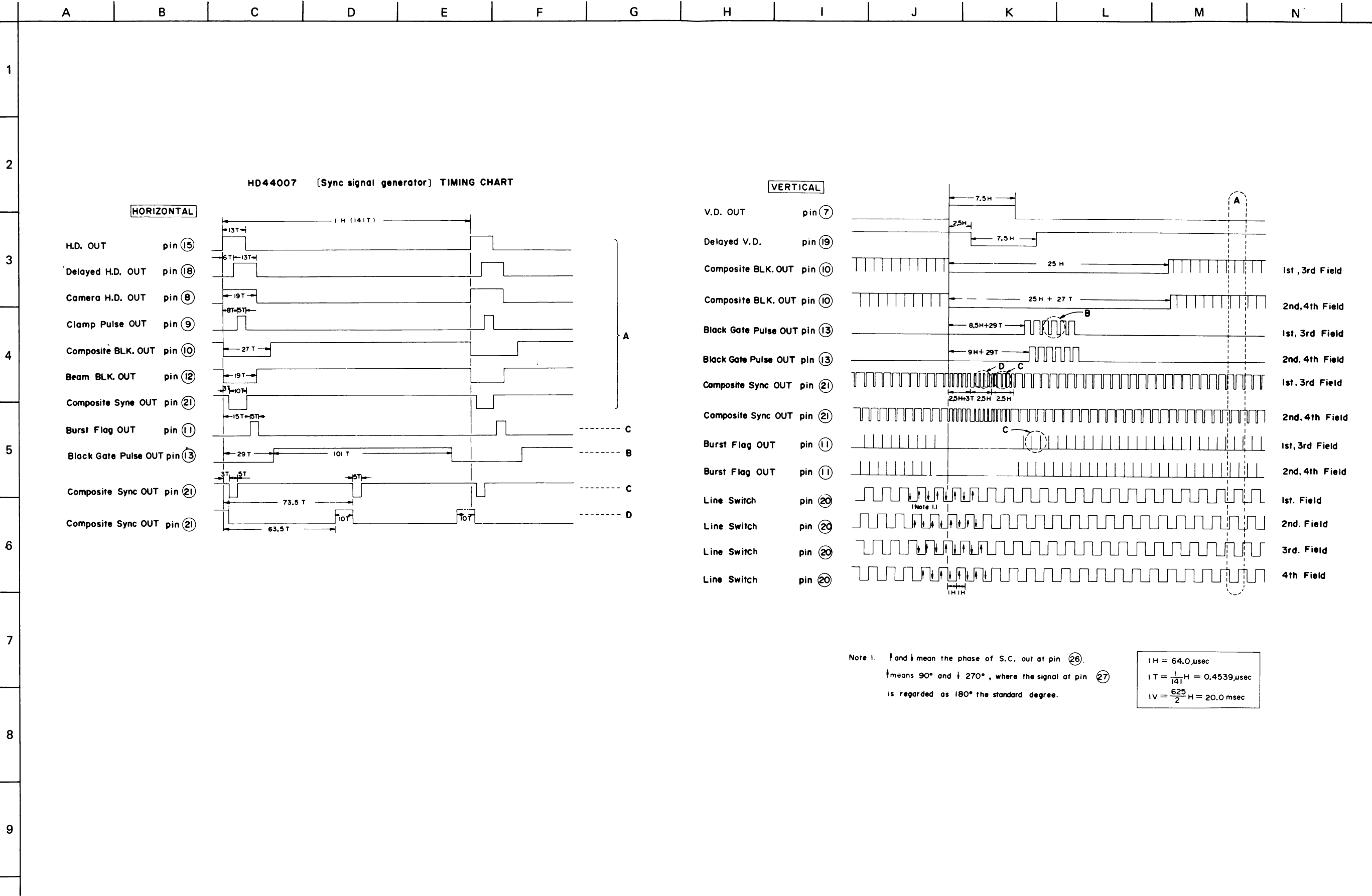
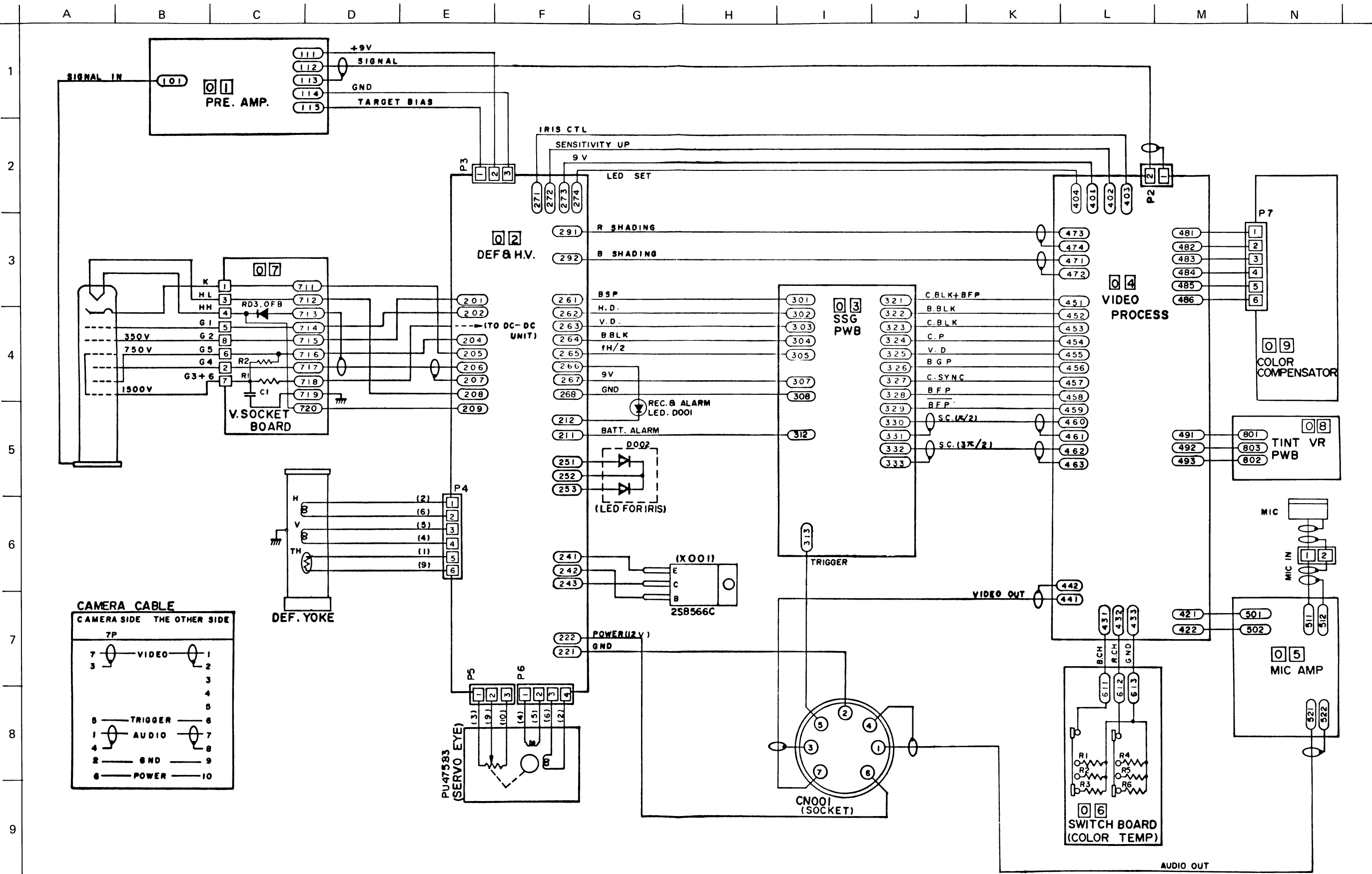


Fig. 2-2 Location of principal parts

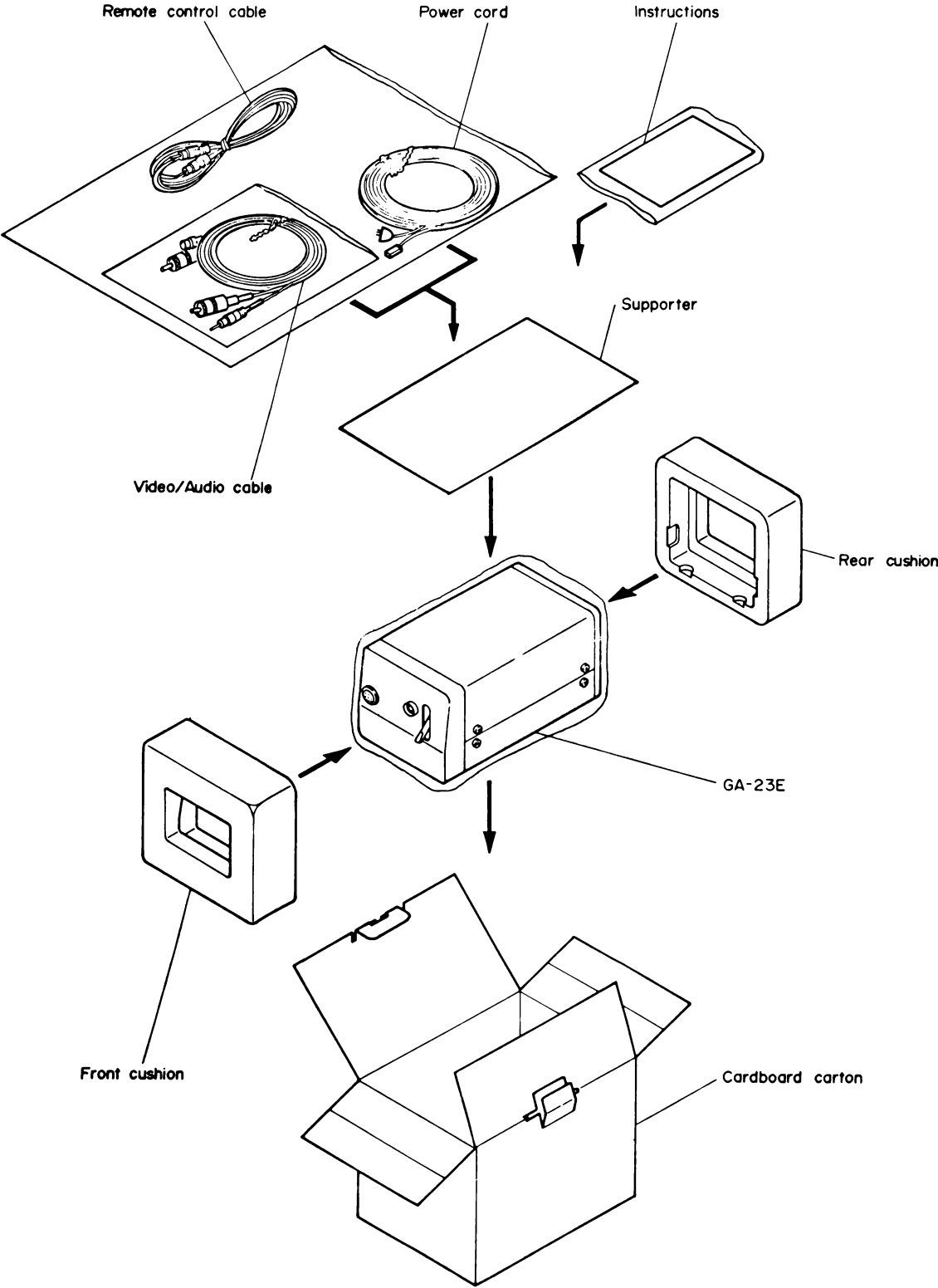
7.11 SSG TIMING CHART



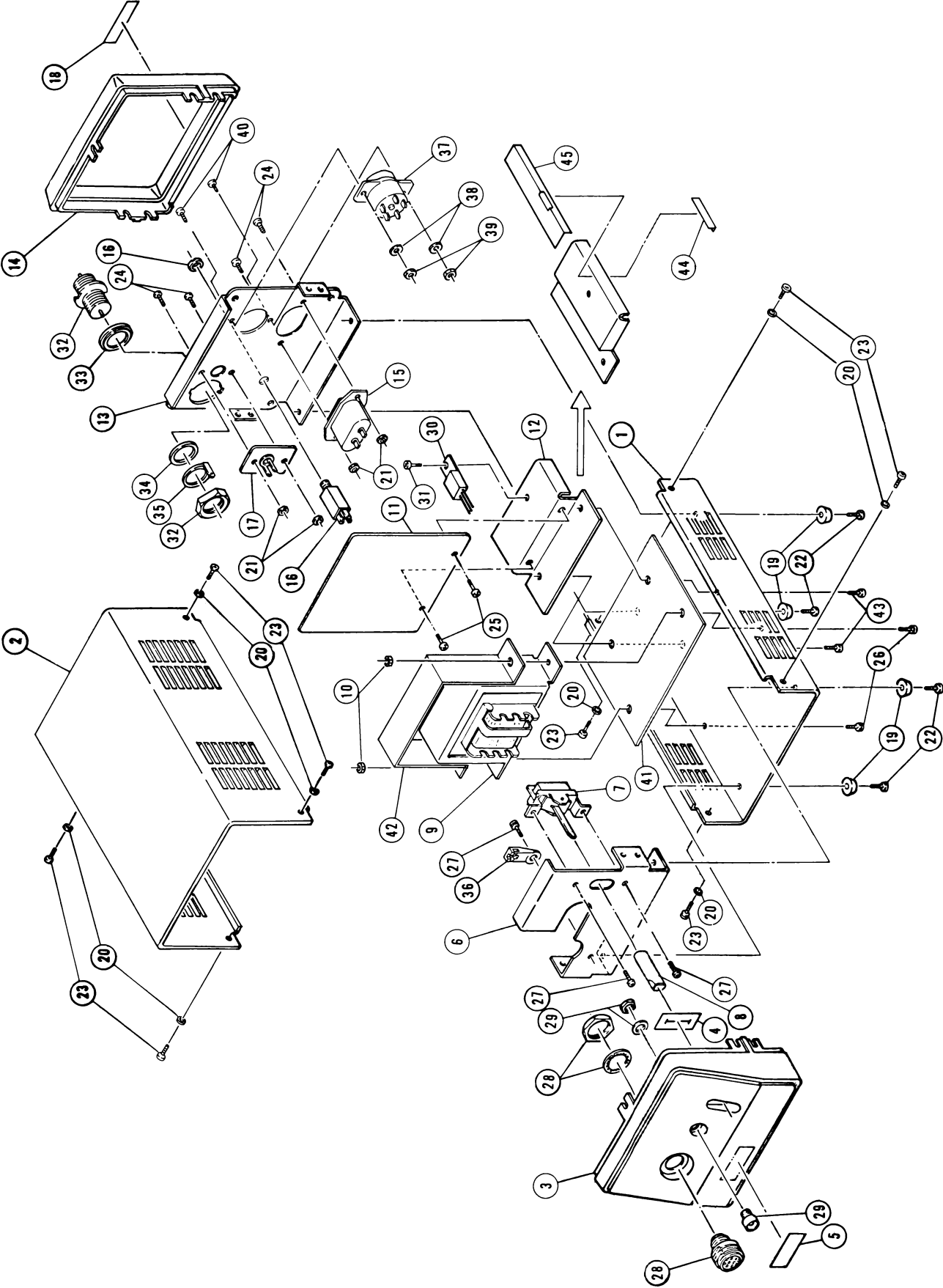
7.12 OVERALL WIRING



SECTION 3
REPACKING



SECTION 4
EXPLODED VIEWS AND PARTS LIST



SAFETY PRECAUTION

Parts identified by the $\triangle$ symbol are critical for safety. Replace only with specified parts numbers.

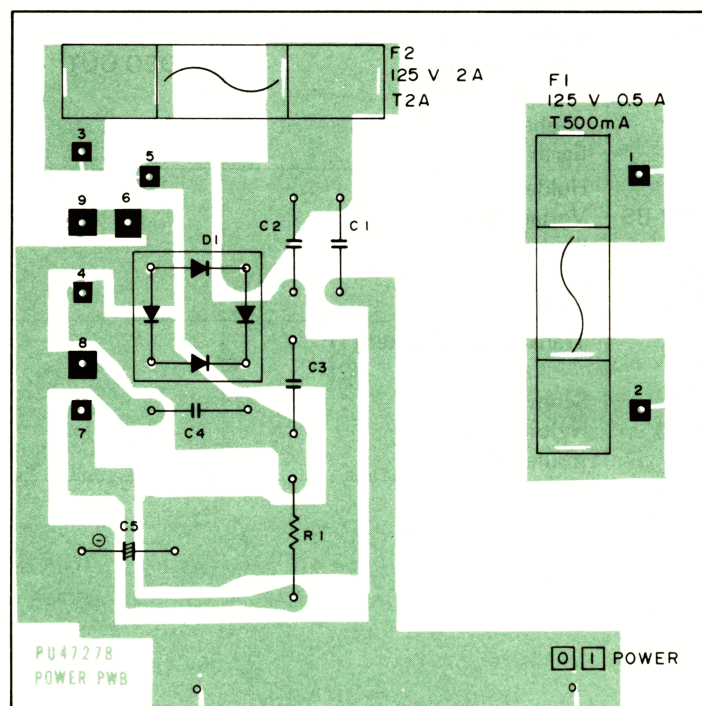
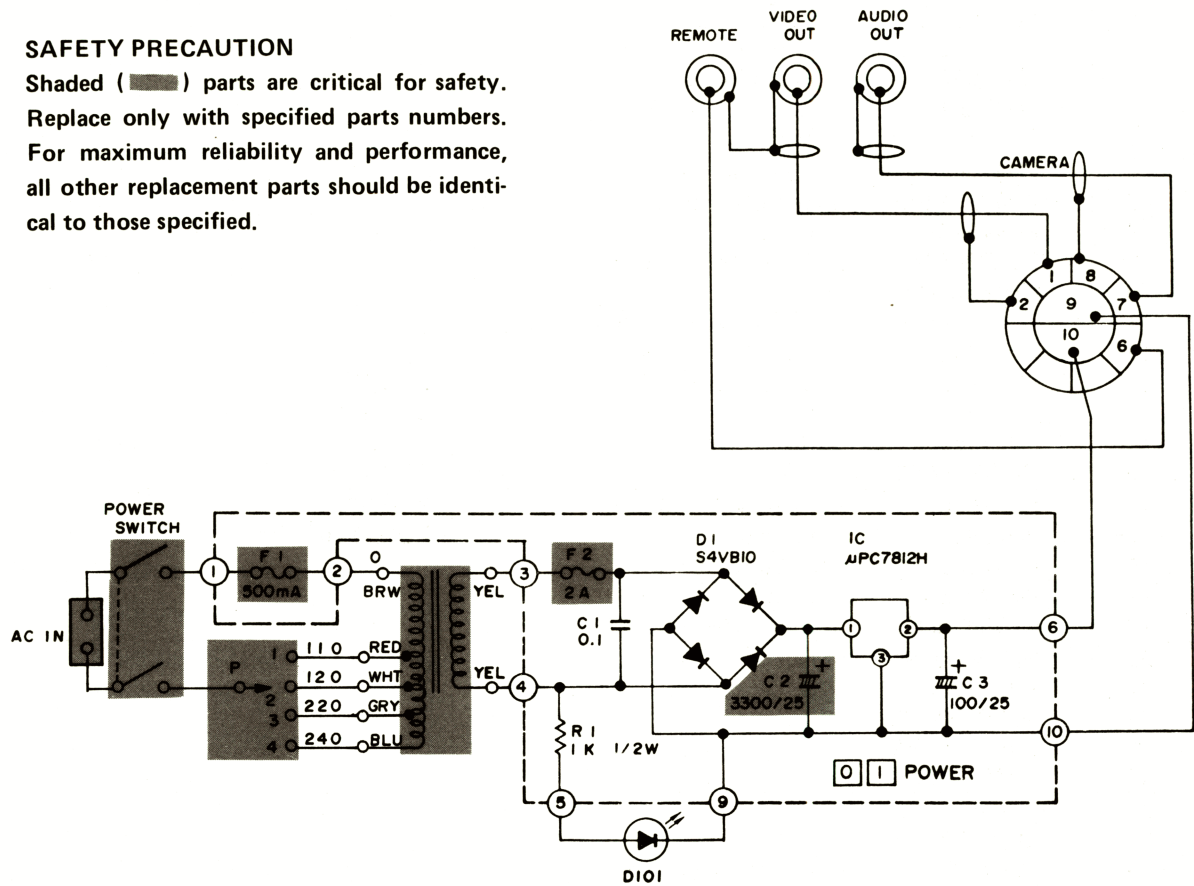
For maximum reliability and performance, all other replacement parts should be identical to those specified.

Symbol No.	Part No.	Part Name	Remarks	Q'ty
1	PU31961-4-8	Lower Case		1
2	PU31960-4-6	Upper Case		1
3	PU31962	Front Panel		1
4	PU47061-2	Felt		1
5	PU45552-5	Mark		1
6	PU47266	Front Bracket		1
7	$\triangle$ PU47274-BS	Lever Switch		1
8	PU47267	Knob		1
9	$\triangle$ PU48205-BS	Power Transformer		1
10	NNB4000ZS	Nut		2
11	—	Power P.W.B. Ass'y		1
12	PU32349	Heat Sink		1
13	PU31959-3	Connector Panel	GA-23EG	1
	" -5	"	GA-23EK	1
14	PU31963	Rear Frame		1
15	$\triangle$ QMC9017-001-BS	AC Connector	AC IN	1
16	PU47500	Remote Jack Ass'y	REMOTE	1
17	PU42930	Pin Jack	AUDIO OUT	1
18	PU47062	Serial No. Sticker		1
19	PU42848-2	Foot		4
20	Q03093-802	Nylon Washer		8
21	NNS3000ZS	Nut		4
22	SDBP3006MS	Screw		4
23	SDBP3006MS	"		8
24	SDBP3008MS	"		4
25	DPSP3006ZS	"		2
26	SPSP4010ZS	"		2
27	LPSP3006ZS	"		3
28	PU47277A	Camera Connector		1
29	PU45616	L.E.D.		1
30	UPC7812H	Integrated Circuit		1
31	LPSP3006ZS	Screw		1
32	GU45073-2	Video Connector	VIDEO OUT	1
33	PU47640	Insulator		1
34	PU47641	Washer		1
35	GU45074	Earth Lug		1
36	PU43981	Holder		1
37	$\triangle$ QSR0074-001-BS	Voltage Selector		1
38	WNS3000N	Washer		2
39	NNS3000ZS	Nut		2
40	SDBP3008MS	Screw		2
41	PU48298	Transformer Bracket (1)		1
42	PU48299	" " (2)		1
43	DPSP3008ZS	Screw		2
44	PU43135-2-30	Nylon Edging		1
45	PU48500	Insulator		1

SECTION 5 DIAGRAMS AND CIRCUIT BOARDS

SAFETY PRECAUTION

Shaded (■) parts are critical for safety.
Replace only with specified parts numbers.
For maximum reliability and performance,
all other replacement parts should be identical
to those specified.



SECTION 6 ELECTRICAL PARTS LIST

1. SAFETY PRECAUTION

Parts identified by the $\triangle$ symbol are critical for safety. Replace only with specified part numbers. For maximum reliability and performance, all other replacement parts should be identical to those specified.

2. Abbreviations in this list are as follows:

RESISTORS — All resistance values are in ohms (Ω).

K : 1 000
M : 1 000 000
CR : Carbon Resistor
Comp. R : Composition Resistor
WR : Wire Wound Resistor
OMR : Oxide Metal Film Resistor
VR : Variable Resistor (Potentiometer)
MFR : Metal Film Resistor
FR : Fusible Resistor

CAPACITORS — All capacitance values are in μF , unless otherwise indicated.

P : μF
C Cap : Ceramic Capacitor
E Cap : Electrolytic Capacitor
FM Cap : Film Mica Capacitor
MM Cap : Metalized Mylar Capacitor
MP Cap : Metalized Paper Capacitor
MY Cap : Mylar Capacitor
NP Cap : Non-polar Capacitor
PC Cap : Polycarbonate Capacitor
PP Cap : Poly Pro Capacitor
PS Cap : Polystyrol Capacitor
T Cap : Tantalum Capacitor
TR Cap : Trimmer Capacitor

Tolerance of resistors or capacitors are as follows:

M : $\pm 20\%$
K : $\pm 10\%$
J : $\pm 5\%$
G : $\pm 2\%$
F : $\pm 1\%$

POWER P.W.B. ASS'Y PU48206C

Symbol No.	Part No.	Part Name	Description
	PU48207	Power P.W.B.	
D 1	S4VB10	Diode	
R 1	QRD123K-102	CR	1 K $\frac{1}{2}$ W, K
C 1	QFH52AM-104	MM Cap	0.1 100 V
$\triangle$ C 2	QEV71ER-338	E Cap	3300 25 V
C 3	QET41ER-107	"	100 "
$\triangle$ F 1	QMF51A2-R50-BS	Fuse	0.5 A
$\triangle$ F 2	-2R0-BS	"	2.0 A
	A44594-001	Fuse Clip	
	PU47030	Sticker	

